Hardware K&F CD 44 Digital System Controller

User's Manual

Version 10.1
Released: 22.04.2009

Important Information, Please Read Before Use!

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Thank you for your decision to buy a Kling & Freitag product. To guarantee a trouble-free operating of the equipment and to enable the CD 44 Controller to achieve its full potential, please read the operating instructions carefully before use.

With the purchase of the CD 44 Controller, you have acquired a device with the highest possible quality and performance capabilities.

As the owner of this system, you now have a versatile and highly professional tool which, when operated properly, is a true pleasure to use.

1. Symbols in User's Manual

Warning	This symbol indicates the possibility of life-threatening danger and a health risk for persons. Not following these instructions may result in serious health problems including potentially fatal injuries.
Caution	This symbol indicates a possibly dangerous situation. Not following these instructions may cause minor injuries or cause property damage.
Important	This symbol gives instructions for the proper use of the described products. Not following these instructions may cause damage to the equipment or other property.

2. Information about this User's Manual

User's Manual K&F CD 44 Digital System Controller, Version 10.1, 22.04.2009

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All specifications in this manual are based on information available at the time of publishing for the features and safety guidelines of the described product.

Technical specifications, measurements, weights and features are not guaranteed.
The manufacturer reserves the right to make product alterations within legal provisions as well as changes to improve product quality.

All persons who use the device must have this guide and all further information for safe operations available to them during assembly, disassembly, and us.

We appreciate any input with suggestions and improvements for this manual. Please send this to us at the following address:

info@kling-freitag.de or to:

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3. Contents

Chapter / Section	Page
1. Symbols in User's Manual	**2**
2. Information about this User's Manual	**2**
3. Contents	**3**
4. General Safety Instructions	**5**
5. Regulations for Disposal	**6**
5.1 Germany	6
5.2 EU, Norway, Island, and Liechtenstein	6
5.3 Other Countries	6
6. Product Description	**7**
7. Software and Firmware Update	**8**
8. Connectors, Functions, Controls and Displays	**8**
8.1 Front Panel	8
8.2 Rear Panel	11
9. Making Adjustments and Navigating Through the Menus	**12**
9.1 The Use of the Shortcut Buttons	12
9.1.1 Parametric Filters 'PEQ' + SEQ LShelv (Filter A Button)	12
9.1.2 Switchable, Speaker Specific Filters (Filter B Button)	16
9.1.3 Input and Output Gains (Gain Button)	18
9.1.4 Input and Output Delays (Delay Button)	19
9.2 InfoWindow: Display of Basic Settings	19
9.3 Main Menu	20
9.4 Submenu	20
9.5 Settings in the Editing Mode	21
9.5.1 Editing Mode with One Editing Line	21
9.5.2 Editing Mode with Several Editing Lines	22
9.5.3 Editing Mode with Selection Lines	23
9.6 Menu Tree of the CD 44 and Explanation of the Functions	24
9.6.1 Functions of the Menu Item 'Setup'	25
9.6.2 Functions of the Menu Items under 'In'	26
9.6.3 Functions of the Menu Items under 'Out'	30
9.6.4 Functions of the Menu Items under 'Util'	33
10. Routings with Examples of Use and Connecting Diagrams	**35**
10.1 'Rack Unit' Connecting Diagram for 1 CD 44 and 2 Amplifiers	36
10.2 K&F 'System Rack' Connecting Diagram	37
10.3 Routing '1 in 4 out' / Setup 'Example 1'	38
10.3.1 Block Diagram	38
10.3.2 Setup 'Example 1', T5 / T9 with B10 on 2 Channels	38
10.4 Routing '1 in 4 out (Linked)' / Setup 'Example 2'	40
10.4.1 Block Diagram	40
10.4.2 Setup 'Example 2', 4 x Line 212-6 with 4 x SW 215E	41
10.5 Routing '2 in 4 out' / Setup 'Example 3'	42
10.5.1 Block Diagram	42
10.5.2 Setup 'Example 3', Line 212/SW 215E & Monitor CA 1215/SW 115E	42
10.6 Routing '2 in 4 out (Linked)' / Setup 'Example 4'	43

10.6.1 Block Diagram 43
10.6.2 Setup 'Example 4', Line 212 / SW 215E, stereo 43
10.7 Routing '4 in 4 out' / Setup 'Example 5' 44
10.7.1 Block Diagram 44
10.7.2 Setup 'Example 5', 4- Way Monitor Setup 44
10.8 Routing '1 in 2 + 2 in 2' / Setup 'Example 6' 45
10.8.1 Block Diagram 45
10.8.2 Setup 'Example 6', Front: CA1515 / SW118E + 2 Adjoining Rooms 45
10.9 Routing '1 in 3 + AUX' / Setup 'Example 7' 46
10.9.1 Block Diagram 46
10.9.2 Setup 'Example 7', 3 x SEQUENZA 10 B Cardioid + SW 115 E 46
10.10 Routing '1 in 4 in 4' / Setup 'Example 8' 47
10.10.1 Block Diagram 47
10.10.2 Setup 'Example 8', Delay-Line 47
10.11 Routing '1 in 3 + 1 in 1' / Setup 'Example 9' 48
10.11.1 Block Diagram 48
10.11.2 Setup 'Example 9', T5 / T9 with B5 and additional Bass B10 48
10.12 Routing '2 in 4 in 4' / Setup 'Example 10' 50
10.12.1 Block Diagram 50
10.12.2 Setup 'Example 10 50
10.13 Routing '1 in 2 + Aux + 1 in 1' / Setup 'Example 11' 51
10.13.1 Block Diagram 51
10.13.2 Setup 'Example 11 51
10.14 Patching: Analog 1&2 Mix / Routing '2 in 4 in 4' / Setup 'Example 12 52
10.14.1 Block Diagram 52
10.14.2 Setup 'Example 12 52
10.15 Sequenza 10 N / W Routing '1 in 4 out' / Setup 'Example 13' 53
10.15.1 Block Diagram 53
10.15.2 Setup 'Example 13' 53
10.16 Sequenza 10 N / W: Routing '1 in 2 + Aux + 1 in 1' / Setup 'Example 14' 54
10.16.1 Block Diagram 54
10.16.2 Setup 'Example 14' 54
11. Subwoofer with integrated Crossover on the CD 44 55
12. SP Speakers on the CD 44 55
13. Recommendations for Configuration 56
13.1 Operating several Speakers per CD 44 Channel 56
13.2 The correct Level Balance between Bass and Top Speakers 56
13.2.1 SW 112 / SW 115D / SW 115E / SW 118E 57
13.2.2 SW 215E / SW 215D / ACCESS B5 / ACCESS B10 / SEQUENZA 10 B 59
14. Instructions for AES / EBU Data Transmission 61
14.1 General Instructions 61
14.2 Transmissions over long Distances 61
15. Wiring 62
16. Operating the Controller 62
17. Technical Specifications CD 44 63

4. General Safety Instructions

CAUTION

Risk of electric shock!
Do not open the unit!

Warning: To avoid electric shock hazard, do not expose this appliance to rain or moisture. The enclosures may only be opened by qualified personnel!

Warning

Do not install devices in any of the following places:

– where the units are permanently exposed to direct sunlight.
– near any heat sources and open fire.
– do not put candles etc. on top of the controller.
– where the airflow for cooling is blocked.
– where they are exposed to high moisture.
– where they are exposed to strong vibrations and dust.

Power supply

Before connecting the AC power cable of the controller, please check if the available voltage is compatible with the operating voltage as indicated on the unit. If this is not the case, then the unit needs to be adapted by the manufacturer or an authorized service centre. If the unit is not compatible with the available voltage, it should never be connected! This could irreparably ruin the controller.
Make sure that the power outlet supplies a ground connector, which must be connected to the unit via the PE conductor of the power cord!
All equipment, which is connected together using signal cables and has a connection to protective earth, must be connected to a common PE conductor. If not, there is a risk of an electric shock or the destruction of the connected equipment. The power plug must always be used to disconnect from the power supply. Furthermore, the power plug must be easily accessible for use at all times.

Protection of electrical cables

Power cords should be laid in such a way that they are protected against footstep damages, tensile strain and against being trapped.

Transportation

When transporting the equipment, make sure that it is protected from vibrations.

Cleaning

The equipment should only be cleaned with a damp cloth and when it is not plugged in.

Pauses in use

The power cord should be disconnected from the power source during longer pauses in use.

Intrusion of liquids

No liquids should intrude or leak into the equipment.

Maintenance and technical service

The user should not perform any maintenance work on the equipment other than that which is described in this manual. Repairs have to be executed by a qualified service technician only.

In the following cases, the unit should be serviced by an authorized technician only if

– the power cord or the mains connectors have been damaged.
– objects or liquids have gotten into it.
– it was exposed to rain.
– it doesn't appear to be functioning properly.
– it has fallen down or the enclosure is damaged.

Important

Unwanted interference

RF interference on the power cord or on the line signal cables may lead to unwanted sound interference.

5. Regulations for Disposal

5.1 Germany

It is not allowed to dispose of used electrical equipment as domestic waste.

But please do not dispose of them at official collecting points for recycling either!

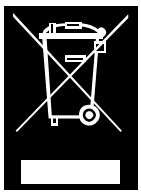
All Kling & Freitag products are plain business-to-business (B2B) products.
Kling & Freitag products labelled with a waste bin sign have thus to be disposed of by Kling & Freitag alone. Please call Kling & Freitag at the number stated below if you have a Kling & Freitag product to be disposed of. We will offer you a straightforward and professional disposal with no costs involved.

If there is no waste bin sign on one of your Kling & Freitag products, because it has been sold before March 2006, then by law the owner is in charge of the disposal. In this case we will be happy to assist and offer you proper ways of disposal.

Telephone number to call about the disposal of used Kling & Freitag products:
+49 (511)-96 99 7-0

Explanation:

With the ElektroG (law relating to electrical and electronic equipment and appliances) we have complied with the EU-directive on waste electrical and electronic equipment (WEEE, 2002/96/EC).



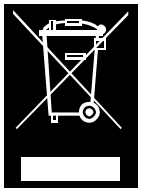
From 03/24/2006 onwards Kling & Freitag GmbH has thus labelled all products mentioned in the WEEE with a sign with a crossed out waste bin and a white bar below. This sign indicates that the disposal as domestic waste is prohibited and that the product has been put into circulation on 03/24/2006 at the earliest.

Kling & Freitag GmbH has been legally registered as a manufacturer with the German registration office EAR. Our WEEE registration number is: DE64110372

For the German Registration office EAR we have accredited that our products are sole B2B products.

5.2 EU, Norway, Island, and Liechtenstein

It is not allowed to dispose of used electrical equipment as domestic waste.



From 08/13/2005 onwards Kling & Freitag GmbH has thus labelled all products for EU-Member countries as well as Norway, Iceland and Liechtenstein (except Germany) mentioned in the WEEE with a sign with a crossed out waste bin and a white bar below. This sign indicates that the disposal on domestic waste is prohibited and that the product has been put into circulation on 08/13/2005 at the earliest.

Unfortunately the European directive WEEE has been complied with implementing different national provisions of law throughout all member countries, which makes it impossible for us to offer consistent solutions for the disposal throughout Europe.

Responsible for complying with these provisions of law is the local distributor (importer) of each country.

For proper disposal of used products in accordance with these local provisions in the mentioned countries of the European Union (except Germany) please ask your local dealer or the local authorities.

5.3 Other Countries

For proper disposal of used products in accordance with local provisions in other than the above mentioned countries please ask your local dealer or the local authorities.

6. Product Description

The signal processor CD 44 is a digital 4 in 4-way speaker controller that can process both analogue and digital signals in the AES/EBU format up to 192 kHz.

The controller is equipped with the finest AD and DA state-of-the-art converters as well as 3 micro-controllers and 8! integrated signal processors (DSP). It not only offers excellent audio results, but also a multitude of special features and novel functions:

Multi-level memory concept for parameter management

The parameter sets for almost all K&F speaker systems are saved in the form of macros in the device (the so-called 'LSBlocks'). They can be copied as a complete set of data and independently of one another into each of the 4 output channels.

The specification of one K&F phase reference for multi-way operations is advantageous because of its high level of compatibility. Without requiring phase adjustments, the various K&F tops can be combined with all K&F subwoofers.

Additional LSBlocks 'Flat' facilitate the integration of third-party products (with limitations) or the processing and linking of signals to speakers with integrated filters and amplifier electronics.

14 pre-configured routings allow every reasonable configuration from up to 4 different input signals to the 4 output channels.

Frequently used combinations of routings and 'LSBlocks' can be saved along with further parameters (such as Gain / Delay / PEQ) in up to 64 set-ups.

Two-step limiter concept

Two limiters work in each of the 4 output channels. A quick reacting "peak limiter" limits the peak level and, thus, the cone excursion of the connected speakers is kept at non-critical levels.

A slow reacting 'RMS Limiter' reduces the level when there is a risk that the permissible average power will be exceeded, thus resulting in the voice coils overheating.

The pre-set values have been established in extensive series of tests. With excellent sound qualities, they provide an outstanding compromise with regard to the peak levels and protection of the speaker systems.

Automatic determination of gain using sense technology

The CD 44 calculates the gain of the connected amplifiers in real-time and automatically corrects the limiters' thresholds as soon as the gain of the connected amplifier should be changed (i.e. by using the input potentiometer or similar). Compared to conventional devices this results in a clearly improved reliability when adjusting the limiter thresholds.

Limiter reduction

The preset limiter thresholds can be reduced in fine increments for specific purposes. This function is advantageous when the connected speakers are to be subjected to a particularly long-lasting high load. In this case, the reduction of the limiter thresholds reduces the maximal thermal and mechanical stress, thus significantly extending the product life of the speakers.

Furthermore, these functions can also be used to limit the sound levels of the speakers.

The integrated limiters and the function 'Limiter Reduction' can also be used for speakers with integrated amplifier electronics. For this, the gain values of the utilised power amplifiers can be edited manually in the CD 44.

Operating with 'Shortcut' buttons

Four buttons with 'Shortcut' functions make it possible to directly jump to often-used functions without having to navigate through the menu. By pushing these buttons repeatedly, you access the functions of all input and output channels.

In doing so, the functions 'Gain', 'Delay', 'Filter' and 'PEQ' can be quickly and easily adjusted.

Additionally, the LEDs which are integrated into the respective buttons indicate if these functions have been changed as compared to the original settings.

31 Band One-Third Octave EQs

A separate 31 band one-third-octave EQ is assigned to each of the CD 44's four input channels. Up to 16 different EQ setups can be saved and administrated in an individual EQ setup library. These EQ setups can be loaded in addition to the setups.

7. Software and Firmware Update

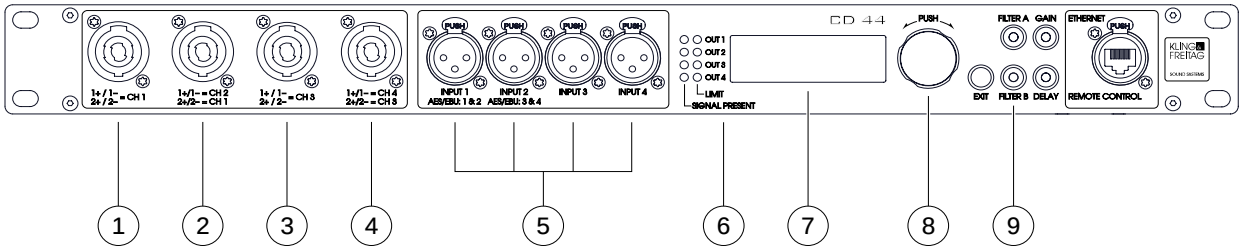
If software and firmware updates are available for the CD 44, they can be found in the download area of the Kling & Freitag website www.kling-freitag.de.

Software and firmware updates are necessary if Kling & Freitag LSBlocks are made available for new speakers or the device's range of function has been expanded. This ensures that the CD 44 will always be up-to-date and assured of a good future for speaker generations to come.

You receive the installation instructions when you execute the update s.

8. Connectors, Functions, Controls and Displays

8.1 Front Panel



(1) - (4) Speaker connectors

4-pin Speakon connectors. All Kling & Freitag speakers that are, by default, connected with 1+ / 1- can be plugged into these connectors.

Caution: The connectors with the position numbers 1 and 3 are connected differently than the connectors with the position numbers 2 and 4.

Interchanging the speaker channels may ruin the speakers in some cases (Example: high frequency speaker on bass output).

(1) This output connector supplies the signal for the speaker channel 1. In this connector, the pin 1+ is bridged with 2+, the pin 1- with 2-. The signal for channel 1 is, therefore, applied to 1+ / 1- as well as 2+ / 2-.

(2) This output connector transmits signals for 2 speaker channels:

The signal for the speaker channel 2 is applied to 1+ / 1-.

The signal for the speaker channel 1 is applied to 2+ / 2-.

(3) This output connector supplies the signal for the speaker channel 3. On this connector, the pin 1+ is bridged with 2+ and pin 1- with 2-. The signal for channel 3 is, therefore, applied to 1+ / 1- as well as 2+ / 2-.

(4) This output connector supplies signals for 2 speaker channels:

The signal for the speaker channel 4 is applied to 1+ / 1-.

The signal for the speaker channel 3 is applied to 2+ / 2-.

(1) + (3) If you want to use the CD 44 to operate bass speakers whose 2 chassis are controlled by separate supply lines (ACCESS B5 and ACCESS B10), then you should use these connectors for these bass systems in order to control the speakers via a common channel without an adapter (CH1 or CH3). Fore more information see configuration example on page 46.

(2) + (4) If you want to use the CD 44 to operate ACCESS tops T5 and T9 or Sequenza 10 N / W with separate high- and mid-range controls, you should use these connectors for the tops because these systems must be controlled using 2 channels.

In order to implement a one-cable system (control of a top and bass via a 4-core supply cable), you must use these connectors, because the top and bass must be controlled using 2 different channels.

(5) **Signal input connectors: INPUT 1 through INPUT 4,** 3-pin XLR female connectors.

These signal input connectors can be used both for analogue and for digital signals, in accordance with the AES / EBU specifications. You must make the selection in the device about the type of signals it is being supplied with: digital or analogue. (Further information on pages 26 and 61). **Select the type of signal source before connecting the signals!**

Upon delivery, the controller is pre-programmed for the use of analogue input signals.

These inputs correspond to the connectors on the rear panel and are wired in parallel with them.

Do not assign the inputs on the front and rear panel simultaneously. This may lead to malfunction or damage of other appliances!

a) **Operations with analogue input signals, settings: In → Input Patching → Analog (Default, Flipped or 1&2 Mix):**

Pin configuration: 1 = ground / 2 = + / 3 = - . The LINE inputs are electronically balanced.

The nominal input level is +6dBu (1.55Vrms).

The maximum input level is +18dBu, that is, the peaks in the signal must not exceed +18dBu (6V).

b) **Operations with digital input signals, setting: In → Input Patching → Digital (Default, Flipped or 1&2 Mix)**

The input connectors 'INPUT 3' and 'INPUT 4' are not used in this setup!

Pin configuration: 1 = ground / 2 and 3 = digital signal.

To avoid unexpectedly high volume levels, reduce the controller's input gains to a value of approx. –40 dBu before supplying these connectors with a digital signal directly from an audio source, and then adjust the level to your needs!
Adjust input gain at: In → Input1 through **Input4 → Gain**

(6) **SIGNAL PRESENT, LIMIT**

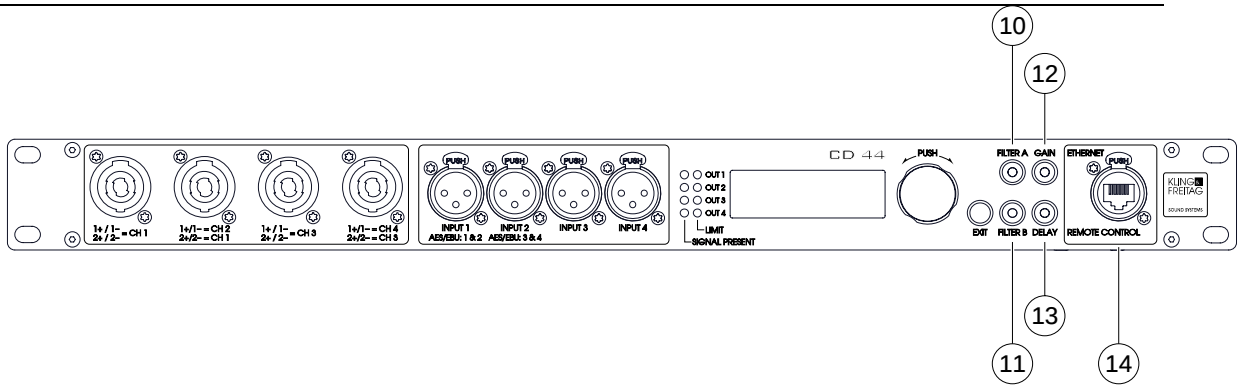
a) **SIGNAL PRESENT:**
These LEDs light up green when a signal with a level higher than –45 dBu is present at the XLR output connectors on the rear of the unit (Out 1 through Out 4).

b) **LIMIT:**
The output level of the controller is limited. As a result, the controller avoids an output level of the power amplifiers which is too high for the connected speaker. These LEDs light up red as soon as the output level of the relevant channel comes under the influence of the controller's limiters. A gently engaging RMS limiter and a fast peak limiter limit the output of the power amplifiers virtually inaudibly to the maximum permitted level. If the red limiter LEDs light up frequently, the level of the input signal should be reduced on the signal source preferably (i.e. on the mixing console).

(7) **Display**
To change the contrast, go to **Util → Display → Contrast**.

(8) **Knob**
Turn the knob to navigate through the menus and adjust the values. Push the knob to confirm a selection, access the submenus, the command lines, and the settings.

(9) **EXIT button**
You can confirm the chosen settings by pushing the EXIT button, and the menu returns to the next higher level.



(10) FILTER A Button (Shortcut Button)

Pushing the FILTER A button allows you to directly access the freely adjustable parametric filters (PEQs) without having to navigate through the menu.

Up to four parametric filters (PEQs) are available for every active input channel.

With the parametric filters, you can adjust the speakers to the room acoustic conditions or eliminate feedback during monitor use.

If a filter is active (BYP = bypass in edit mode not active), the blue LED on the FILTER A button lights up.

For a detailed description see: **Parametric Filters 'PEQ' + SEQ LShelv (Filter A Button)** beginning on page 12.

(11) FILTER B Button (Shortcut Button)

By pushing the FILTER B button, you can access pre-set speaker-specific filters, such as High-Boost, Cluster and Bass Boost, etc.

These filters cannot be adjusted by the user; they can only be switched on or off.

If one of these filters is active, the blue LED on the FILTER B button lights up.

For further information see chapter **Switchable, Speaker Specific Filters (Filter B Button)** beginning on page 16.

(12) GAIN Button (Shortcut Button)

Pushing the GAIN button allows you to directly access the input and output gains without having to navigate through the menu.

After pushing the GAIN button, the first possible setting is for the signal input (input gains). If you push it repeatedly, you access the output gains.

If one of these gain values is not zero, the red LED on the GAIN button lights up.

For further information see chapter **Input and Output Gains (Gain Button)** beginning on page 18.

(13) DELAY Button (Shortcut Button)

After pushing the DELAY button, the first settings you access are for the input delays. After repeatedly pushing the button, the output delays are then accessed.

If one of these delay values is not zero, the red LED on the DELAY button lights up.

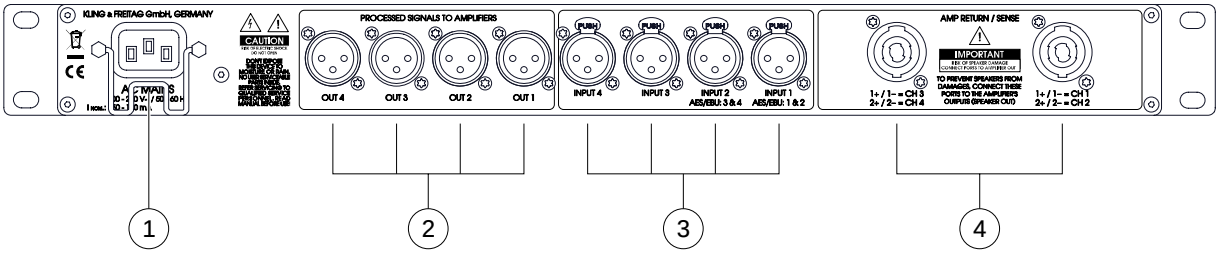
For further information see chapter **Input and Output Delays (Delay Button)** beginning on page 19.

(14) REMOTE CONTROL

This RJ45 connector allows for you to connect the CD 44 to a computer or integrate it into a network in order to execute remote enquiries and remote control or to import software updates. The connection conforms to Ethernet standards. The IP address can be changed at **Util → IP Address**.

Kling & Freitag software will be provided in the future.

8.2 Rear Panel



(1) Power Supply Connector

IEC power socket 100 - 240 V~ / 50 - 60 Hz, I nominal: 150 - 100 mA.
Connect this socket to a mains outlet using the mains cable supplied with the controller. To avoid an unintentional loosening of the mains cable, the power supply connector is provided with a safety clamp. Flip the clamp over the connector of the mains cable after having plugged it into the power supply connector.

Pay attention to the stated mains voltage. Connection to an incorrect mains voltage may result in irreparable damage!

(2) OUT 1 through OUT 4

3-pin XLR male connector, pin assignment: 1 = ground / 2 = + / 3 = -

These outputs deliver the line signal processed by the controller to the power amplifiers. Connect these outputs to the inputs of the power amplifiers.

Signal input connectors: INPUT 1 through INPUT 4, 3-pin XLR female connectors.

These connectors correspond to the connectors on the front and are wired in parallel with them. For a detailed description of the inputs see page 9.

Do not assign the inputs on the front and rear panel simultaneously. This can lead to malfunction or damage of other appliances!

(4) AMP RETURN / SENSE

1+ / 1- = CH 1
2+ / 2- = CH 2
and
1+ / 1- = CH 3
2+ / 2- = CH 4

You must plug the amplified output signals of the power amplifiers into these connectors (speaker signal).

The amplified output signals which are connected here are required by the limiters in the controller (sense signal). The signal is routed to the Speakon connectors CH 1, CH 2, CH 3 and CH 4 on the front, so that the speakers can be connected.

If the connectors 'AMP RETURN / SENSE' are not connected to the power amplifiers, then there is a risk that the speakers will be ruined. Exception: When using the CD 44 with SP speakers, the AMP RETURN / SENSE inputs are not used, as the SP speakers are equipped with their own limiters. More about this in chapter SP Speakers on the CD 44 on page 55.

9. Making Adjustments and Navigating Through the Menus

In this chapter, we will give a detailed description of how to make adjustments or to save or cancel changes and how to navigate through the menus.

9.1 The Use of the Shortcut Buttons

The shortcut buttons help you to make quick adjustments without having to navigate through the menu. We therefore recommend that you solely use the shortcut buttons and not the menu navigation when making adjustments to the parametric filters (PEQs), the input and output gains, as well as to the input and output delays.

Adjustments that are made using the shortcut buttons do not have to be confirmed by pushing the exit button. After approx.10 seconds, the adjustments made to the device are confirmed automatically.

9.1.1 Parametric Filters 'PEQ' + SEQ LShelv (Filter A Button)

By pushing the Filter A button, you access the parametric Filters (PEQ).

Using the menu navigation, the PEQs can be accessed at **In → PEQ → Filter 1** through **Filter 4**.

Up to 4 parametric filters per input channel serve to equalise the system, i.e. to adjust the speaker frequencies to the room conditions. They can also be used to eliminate the feedback during monitor uses. The PEQs are saved with the setup.

In the PEQs, the parameters for filter type, gain, frequency, and Q-factor can be adjusted.

If a filter is activated (not set at BYP = bypass in the editing mode), then the blue LED of the filter A button will light up.

If you change to another type of filter, the Q-factor automatically sets itself to a value of 0.707. This safeguards against unexpectedly high levels which might be caused by a Q-factor that is too high. When you have changed the type of filter, always make sure if a Q-factor of 0.707 meets your needs and correct it, if necessary.

Explanation of the filter types of the PEQ:

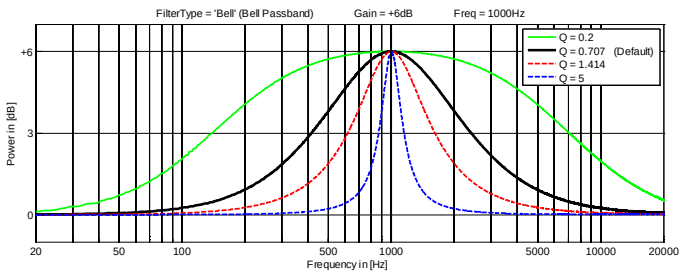
The parameter "Gain" is adjustable in steps of 0.1, from -96 to +24 dB (independent of the input and output gains). The parameter 'Gain' has no effect on the filter types 'LowP', 'HighP' and 'AP.

The parameter "Freq" is adjustable in 1Hz steps, from 10Hz to 20kHz.

1. **Bell = Bell Filter**

   This filter increases certain frequency ranges (positive gain) or attenuates them (negative gain).

   The gain determines the maximum or minimum level increase or attenuation of the filter (in the graph: increase of +6dB.



   This 'bell' is logarithmically symmetrical relative to the selected frequency (in the example: 1000 Hz).

   The Q-factor defines the quality of the filter. In doing so, it determines the width of the frequency range which is to be increased or attenuated. The higher the Q-factor, the narrower the frequency range. A lower Q-factor thus has a wider range.

   "Q" is adjustable in steps of 0.001 from 0.2 to 20.

Typical Q-values and their bandwidth equivalent:

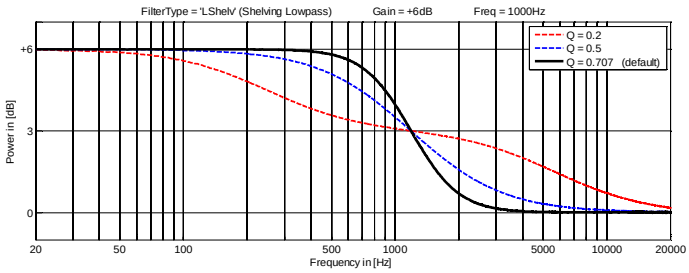
Bandwidth	Q- Factor
1/6 octave (whole step)	8.651
1/3 octave (third)	4.318
2/3 octave (two thirds)	2.145
1 octave	1.414
1 1/3	1.044
1 2/3	0.819
2	0.666

2. **HShelv = High Shelving Filter and**

3. **LShelv = Low Shelving Filter**

These filters increase (positive gain) or attenuate (negative gain) the frequencies **below** or **above** the selected frequency.
Below =LShelv.

Above =HShelv.



Low Shelving Filter

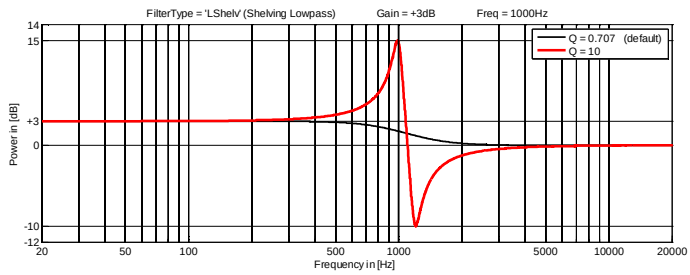
The Q-factor determines the slope of the filter.

Normally, shelving filters are used with a Q-factor of up to 0.707.

With Q-factors higher than 0.707, the selected frequency is increased and an area above this frequency range is attenuated correspondingly. The shelving filter is, thus, normally only used up to Q 0.707.

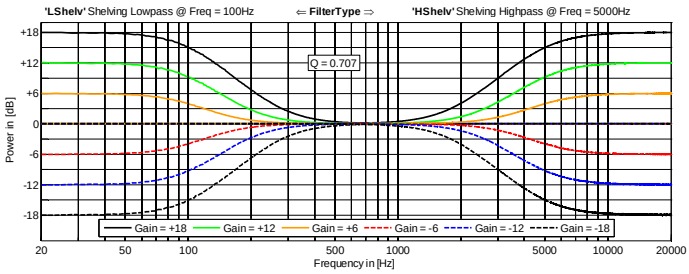
A Q higher than 0.707 may result in unwanted sound changes (see graph).

Q is adjustable in 0.001 steps from 0.2 to 20.



Low Shelving Filter, Q > 0.707

SEQ LShelv:
As soon as a SEQ10 LS block is loaded into the controller, the corresponding input channel of the input filter 4 is set to SEQ LShelv. Furthermore, frequency, Q-factor and gain are limited to sensible levels for this use. It is necessary to set an LShelv for all tops in order to counteract the coupling of the arrayed low-mid speakers
.



Different increases and attenuations:
Low Shelving Filter @ 100 Hz,
High Shelving Filter @ 5 kHz,
Q = 0.707

The LShelv is to be programmed **IDENTICALLY** for **EVERY** input path of all tops.

SEQ LShelv setting for exemplary speaker arrays (recommended values):

Depending on the spatial geometry and other application-specific factors, the values that must actually be set in practice may vary from the below-mentioned recommended values. This is why the sound engineer should always fine tune the output gains when setting up the system.

The filter depth and the cut-off frequency of the low shelving filter depend on the amount of speakers. The larger the number of speakers

a. the stronger the attenuation

b. and the lower the cut-off frequency

The attenuation can be set from 0 to -14 dB, the cut-off frequency from 250 Hz – 1.2 kHz, Q from 0.5 – 1.0.

The following chart shows reference values for selecting the SEQ LShelv for all SEQUENZA 10 tops in each corresponding array:

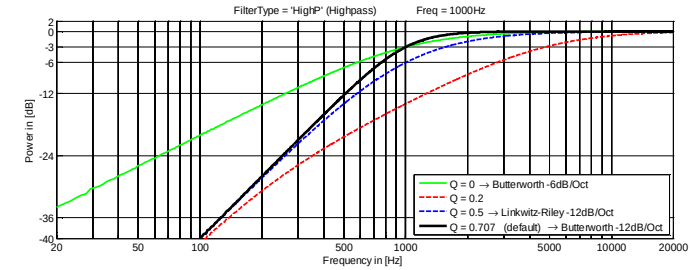
No. of speakers	FRQ	Q	Filter Depth
1 - 6	1 kHz	0.7	-4.5 dB
7 - 8	850 Hz	0.7	-7 dB
9 - 10	850 Hz	0.7	-9 dB
11 - 12	500 Hz	0.7	-8.5 dB
13 - 16	300 Hz	0.7	-11 dB
17 - 18	250 Hz	0.7	-11 dB
19 - 20	350 Hz	0.5	-12 dB
21 - 22	250 Hz	0.5	-13 dB
23 - 24	250 Hz	0.5	-14 dB

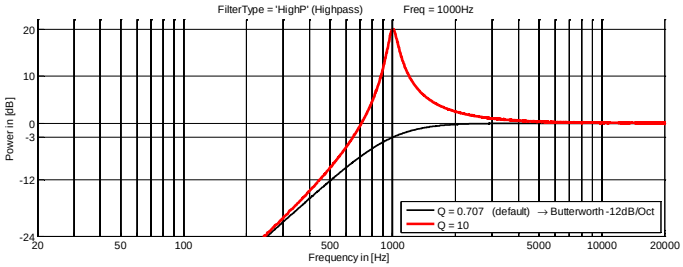
4. HighP = High Pass Filter

This example shows different high pass filters which are characterised by varying Q factors.

The resulting filter Q = 0.707 is a 2nd order Butterworth filter and causes attenuation of 3 dB at the cut-off frequency (-3dB @ 1000Hz). Below the cut-off frequency, there is an attenuation of 12 dB per octave (-12dB/octave).

A Q higher than 1 causes a level increase at the crossover frequency.


FilterType = 'HighP' (Highpass)
Freq = 1000Hz
Power in [dB]
Frequency in [Hz]
Q = 0 → Butterworth -6dB/Oct
Q = 0.2
Q = 0.5 → Linkwitz-Riley -12dB/Oct
Q = 0.707 (default) → Butterworth -12dB/Oct



"Q" is adjustable in steps of 0.001 from 0.2 to 20. If a Q of 0 is selected, then the filter is switched to the 1st order.

The parameter 'Gain' has no effect with the filter type HighP.

The following table illustrates how you can implement the common high and low pass filters and how many parametric filters you need to do so.

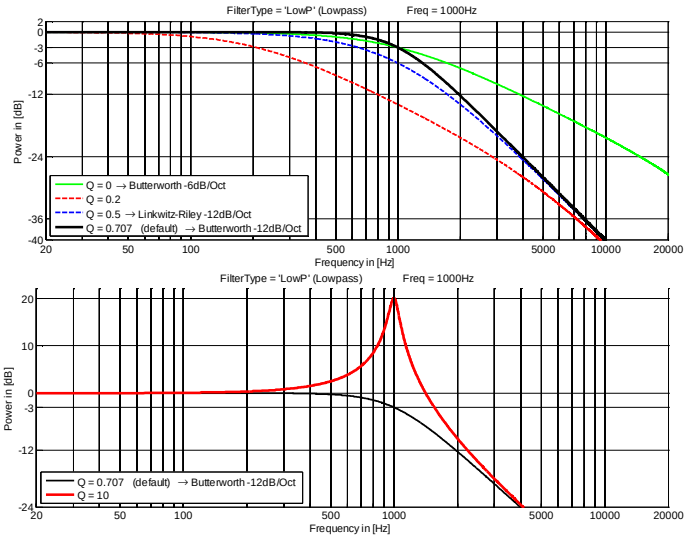
Type of Filter	Slope	Number of necessary PEQs	Q high / low pass filter 1	Q high / low pass filter 2	Q high / low pass filter 3	Q high / low pass filter 4
Butterworth 1st ord.	6 dB/oct.	1	0	-	-	-
Butterworth 2nd ord.	12 dB/oct.	1	0.707	-	-	-
Linkwitz-Riley 2nd ord.	12 dB/oct.	1	0.5	-	-	-
Butterworth 3rd ord.	18 dB/oct.	2	1	0	-	-
Butterworth 4th ord.	24 dB/oct.	2	1.307	0.541	-	-
Linkwitz-Riley 4th ord.	24 dB/oct.	2	0.707	0.707	-	-
Butterworth 5th ord.	30 dB/oct.	3	1.618	0.618	0	-
Butterworth 6th ord.	36 dB/oct.	3	1.932	0.707	0.518	-
Linkwitz-Riley 6th ord.	36 dB/oct.	3	1	1	0.5	-
Butterworth 7th ord.	42 dB/oct.	4	2.247	0.802	0.555	0
Butterworth 8th ord.	48 dB/oct.	4	2.563	0.9	0.601	0.51
Linkwitz-Riley 8th ord.	48 dB/oct.	4	1.307	1.307	0.541	0.541

5. LowP = Low Pass Filter

This example shows various low pass filters at 1000Hz, which are characterised by different Q-factors.

The resulting filter with Q = 0.707 is a 2nd order Butterworth filter and causes an attenuation of 3dB at the cut-off frequency (-3dB @ 1000Hz). Above the cut-off frequency, there is an at-attenuation of 12dB per octave (-12dB / octave).

A Q higher than 1 causes a level increase of the crossover frequency.


FilterType = 'LowP' (Lowpass)
Freq = 1000Hz
Power in [dB]
Frequency in [Hz]
Q = 0 → Butterworth -6dB/Oct
Q = 0.2
Q = 0.5 → Linkwitz-Riley -12dB/Oct
Q = 0.707 (default) → Butterworth -12dB/Oct
FilterType = 'LowP' (Lowpass)
Freq = 1000Hz
Power in [dB]
Frequency in [Hz]
Q = 0.707 (default) → Butterworth -12dB/Oct
Q = 10

"Q" is adjustable in steps of 0.001 from 0.2 to 20. If a Q of 0 is selected, then the filter is switched to the 1st order.

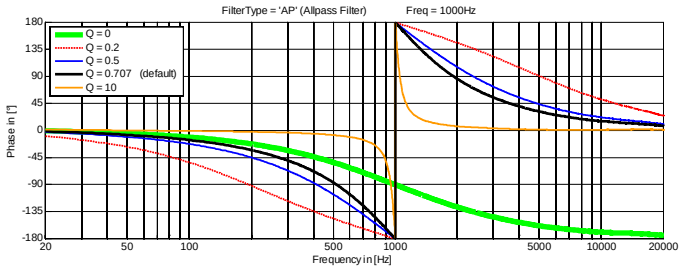
The parameter 'Gain' has no effect with the filter type LowP.

In the section HighP = High Pass Filter, you will find a table for high and low pass filters that shows examples of how to implement common low pass filters and how many parametric filters are required to do so.

6. AP = All Pass Filter

The all pass filter is a frequency-dependent phase shifter. In doing this, it does not cause any increase or attenuation of frequency levels.

The Q-factor determines the slope of the phase changes. The higher the factor, the steeper the slope.



For a 1st order all pass filter, 0 must be selected for the Q. Values higher than 0 produce a 2nd order all pass filter.

9.1.2 Switchable, Speaker Specific Filters (Filter B Button)

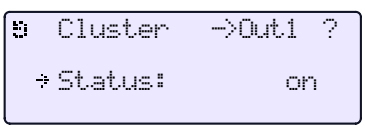
By pushing the Filter B button, you access the preset speaker-specific filters. **You cannot access this filter setup via the menu navigation, but only by using the shortcut button**. These filters cannot be set by the user – they can only be switched on or off and are a part of the LSBlocks. Depending on which speaker was selected for which output, there are various filters available. The speakers are assigned as follows:

Out → Output1 through **Output4 → Select LS Block**.

Push the Filter B button until you accesse the filter which you wish to switch on or off.

If one of these filters is switched on, then the blue LED of the Filter B button will light up.

This illustration shows a cluster filter which is assigned to a speaker at Out1.



The following table shows which filters are available for the relevant LSBlocks:

Speaker (LSBlocks)	Filter 1	Filter 2
SONA 5	Presence	High Boost
CA-Series and Line 212	Cluster	High Boost
SW-Series, all B5 and B10	Cluster	/
B10 SubLow	Bass Boost	/
ACCESS High	/	High Boost
ACCESS Mid (Clus / Sngl)	/	/
ACCESS B5	/	/
ACCESS B10 (all versions)	Bass Boost	/
SEQ 10 LF / HF FR	Straight	High Boost
SEQ 10 LF / HF LCut	Straight	High Boost
SEQ 10 LF (FR and LCut)	Straight	
SEQ10B (all versions)	/	Combi Mode

Explanations for the speaker-specific filters:

- **Presence:** Mid boost. To achieve sound compatibility with the SONA 5 without the CD 44, switch on this filter along with the High Boost Filter.
- **High Boost SONA 5:** slight increase using a Shelving Filter. To achieve sound compatibility with the SONA 5 without the CD 44, switch on this filter along with the Presence filter.
- **High Boost:** To compensate high-range attenuation over long distances for tops.

  Sequenza 10 N / W: The high boost filter should only be switched on for speakers whose main beam is directed towards audience sections that are approx. 40 m or further away. Normally, this only applies to a few of the upper speakers.
- **Cluster:** To compensate undesired frequency additions in the low-mid range for monitor and cluster usage (cluster = several speakers placed directly next to one another).
  - Switch on the Cluster Filter for tops if you wish to operate several tops (cluster) next to one another or if you place the top on the floor as a monitor. This reduces the frequency additions in the low/mid range that result from clustering the speakers (with one another or on the floor).
  - If you operate several tops aligned next to one another (cluster), then there is an addition of certain frequencies that can interfere with the sound results. This frequency addition is compensated by the cluster filter. If these clusters are positioned on a subwoofer, then the phasing between the tops and the subwoofer can be improved when both ways run through the same filter, in other words: when the cluster filter is also switched on for the subwoofer.
- **Bass Boost:** To boost the bass for usages with the ACCESS B10 speakers.
- **Straight (Sequenza 10 N / W only):** The straight filter serves to harmonise the balance of the upper-mid range between shorter and larger listening distances. It is preferably used for speakers whose angle to the other speakers is 0°, 1° or 2.

  The Straight-Filter must be switched in both paths of the speaker, so in the SEQ 10LF/HF (FR or LCut) and the SEQ 10LF (FR or LCut) to 'ON'.
- **Combi Mode:** Switch on this filter if you want to use the subwoofer SEQUENZA 10 B with K&F tops other than the SEQUENZA 10 N or SEQUENZA 10 W.

9.1.3 Input and Output Gains (Gain Button)

Pushing the GAIN button allows you to directly access the input and output gains without having to navigate through the menu.

After you push the GAIN button, the first possible setting is for signal input (input gains). If you push it repeatedly, you access the output gain.

If one of these gain values is not zero, the red LED on the GAIN button lights up.

How high a gain can actually be set depends on, among other things, if and how high an output gain is already preset in an LSBlock. The output gains saved in the LSBlock are neither visible nor adjustable. Depending on the LSBlock, these output gains have values between 0dB and +5.3 dB. It is, therefore, possible that the user can set the gains accordingly lower than the otherwise possible +24 dB. We generally advise against selecting such high gain values.

a) The **Input Gains** regulate the level for the line signal input (INPUT 1 through INPUT 4).

Using the menu navigation, the input gains can be accessed at
In → Input1 through **Input4 → Gain**.

Depending on the output gain and the previously used gain in the LSBlock, the input gains can be set between -96 dB and +24. The sum of the input gain, the output gain, and the LSBlock's gain can not exceed +24 dB.

Adjustments to the input gains may be necessary if, for example, the limiter LEDs light up often. In this case, the input gains can be reduced.

If the input signal is too weak, use the input gains to increase it.

You can find an overview of the input gain settings on a prompt, subsequently referred to as InfoWindow 1. This InfoWindow 1 initially appears approx. 7 seconds **after turning on** the device, or when you have not used it for approx. 7 seconds, or after you have pushed the EXIT button several times.

You can find more detailed information about this in the chapter I beginning on page 19

b) The **Output Gains** regulate the level of the individual signal outputs (OUT 1 through OUT 4).

You can access the output gains at
Out → Output1 through **Output4 → Gain** in the menu.

Depending on the input gain and the gain previously used in the LSBlock, the output gains can be set up between -96 dB and +24. The sum of the input gain, the output gain, and the LSBLock's gain can not exceed +24 dB.

The output gains are used for, for example:

– level adjustments for different zones of sound coverage.

– level adjustments between top speakers and bass systems. When the number of arrayed bass speakers is doubled, the level increases by up to + 6 dB (+3 dB efficiency and +3 dB by doubling the power amplifier output). Due to their directivity, the level of the top speakers does not increase correspondingly.

Furthermore, a flown bass speaker can be several decibels quieter than a bass system which is standing on the floor (because of floor reflections)).

The output gain functions offer the possibility to adjust this level balance, depending on the configuration and use.

According to the room geometry, the actual level balance which needs to be adjusted may differ from the aforementioned reference values. It is, therefore, always necessary for a sound technician to carry through fine adjustments of the output gains when the system is set up.

9.1.4 Input and Output Delays (Delay Button)

After pushing the DELAY button, the first settings you access are for the input delays. Pushing the button repeatedly will give you access to the output delays.

The units for the delays can be converted from milliseconds (ms) to metres (m) at **Util →** **Units**. The unit 'Metre' is based on a sound velocity of 343 m/s at 20°C.

If one of these delay values is not zero, the red LED on the DELAY button lights up.

a) Use the **Input Delays** to create delay lines.

Delay lines are speakers which are set up behind one another. The delay times of the speakers' sound propagation is compensated using delays.

The purpose of delay lines is to ensure that the sound from the speakers near the stage reaches the listeners in the back of the audience simultaneously (preferably) with the sound from the speakers in the rear audience area.

You can separately adjust the delays of up to four input channels, with every channel having a total available delay of 200 ms or 68.6 m. Because a delay of 0.02 ms is already set up in the LSBlock ACCESS High, the available delay time when using this LSBlock is reduced accordingly by this amount.

b) Use the **Output Delays** to compensate differences in delay time of the positioned speakers, for example from flown tops to standing bass speakers, stage edge speakers to the main system, etc. You can separately adjust a total of 4 output channels.

Out 1 and Out 2 share 20 ms or 6.86 m delay time.

Out 3 and Out 4 also share 20 ms or 6.86 m delay time.

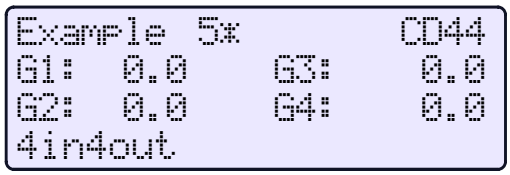
These values decrease if there is already a delay set in an LSBlock.

If you select a delay of 5 ms or 1.715 m for Out 1, then there are another 15 ms or 5.145 m available for Out 2. The same also applies for Out 3 and Out 4. The value stated next to 'Avl =' indicates how much delay time is still available.

9.2 InfoWindow: Display of Basic Settings

A window initially appears, subsequently referred to as InfoWindow 1, approx. 7 seconds **after turning on** the device, or when you have not used it for approx. 7 seconds, or after you have pushed the EXIT button several times. If you are currently in **InfoWindow 1**, and you then turn the knob to the right (clockwise), you will access **InfoWindow 2**.

This illustration shows InfoWindow 1 for the loaded setup 'Example 5':



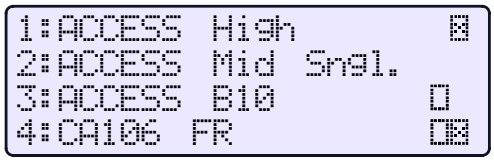
The **InfoWindow 1** shows information about the following basic settings:

1st line: Name of the loaded setup, here: Example 5. If there is an asterisk next to the setup name, this means that changes have been made to the setup that have not been saved yet.

2nd and 3rd line: Settings of the Input Gains 1-4 (Depending on routing, 1 to 4 adjustable gains).

4th line: type of routing, here: 4in4out.

This illustration shows InfoWindow 2 for the loaded setup 'Example 1' with additionally activated filters:



The **InfoWindow 2** shows which speaker block (LSBlock) is assigned to which output (1-4).

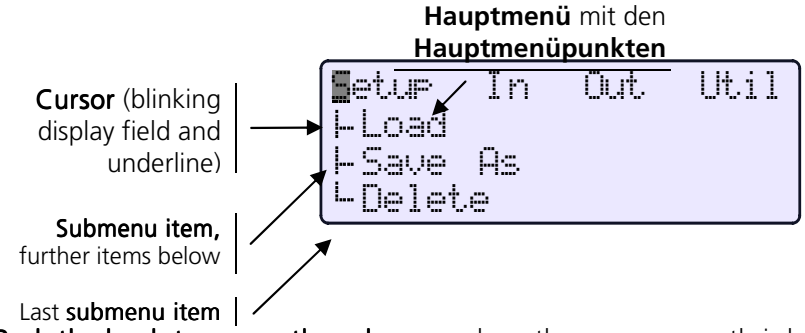
Furthermore, it also gives you information about the status of the selectable speaker-specific filters (ON / OFF). The left box stands for Filter 1, the right box for Filter 2. If a box is checked off, then the corresponding filter is active. If there is no box, then the filter for the corresponding speaker (LSBlock) is not available. You can find further information about the filters in chapter **Switchable, Speaker Specific Filters (Filter B Button)** beginning on page 16.

9.3 Main Menu

If you are in InfoWindow 1 or 2, you can return to the main menu by pushing the knob.

The main menu consists of the following main menu items: **Setup**, **In**, **Out** and **Util.**

Turn the knob to make the blinking cursor (position indicator) move horizontally to the corresponding main menu item.
If the cursor is at a certain menu item, the corresponding submenu appears. In the following illustration, the cursor is initially at the main menu item **Setup**. If you turn the knob some more, then the cursor moves on to the further main menu items **In**, **Out**, and **Util.**



Push the knob to access the submenu where the cursor currently is located. In the following example, the cursor has been moved to the main menu item **Util** which was selected by pushing the knob.

9.4 Submenu

Turn the knob to move the cursor vertically to the available submenu items. The illustration shows the submenu items **Routing**, **Display**, and **Rights**, and the cursor was moved to **Display**. (You will find the further submenu items by moving the cursor down further.)

By pushing the knob, you gain access to the Editing Mode of the submenu item, where the cursor is located. In this example, it is in the editing mode **Display**.

9.5 Settings in the Editing Mode

All settings are executed in real time.

There are three different editing modes:

1. Editing mode with one editing line
2. Editing mode with several editing lines
3. Selection Mode with selection lines

9.5.1 Editing Mode with One Editing Line

In order to follow the aforementioned example, we will show the editing mode with one editing line: the editing mode **Contrast** of the submenu item **Display**.

Changing parameters

The underline marks if you can change the parameters in increments of 1 or 10 (In other editing modes, further increments are also possible). In the illustration below, the underline is below the zero, this means, the ones digit will be changed.

You can change the parameters in increments of one by turning the knob f.

If you wish to **change the parameters in increments of 10**, then **push the knob once** so that the cursor blinks. In this case it is blinking in the ones place.
Turn the knob to the left so that the underline is under the tens place (the cursor is no longer blinking). Then you can change the parameters in increments of 10 by turning the knob.

Confirm changes

To confirm the changes made in the current editing mode, push the EXIT button 2x. The screen returns to the preceding submenu. The settings are kept until a new setup is loaded or until the settings are changed. Changes that have been made in fewer than 10 seconds before the device is shut down are lost after it is turned off. Please wait at least 10 seconds after having made final changes before turning off the controller.

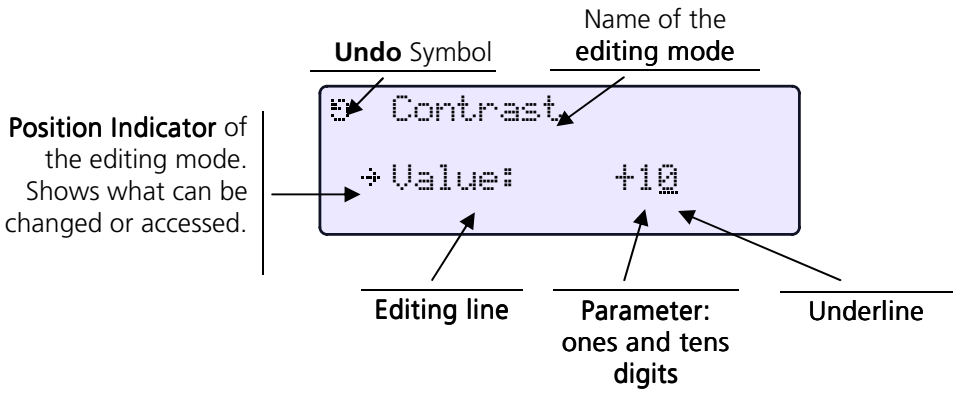
To permanently store changes in a setup, save the setup at: **Setup → Save As.**

The following changes are not saved with a setup and are, therefore, maintained even after a setup has been loaded: InSelect, EQ 31-Band, Display, IP-Address, Units.

Undo (cancel changes)

To undo the changes made in the editing mode, turn the knob while the cursor is blinking (push the EXIT button 1x) to the left until the position indicator (arrow) points to the undo symbol. Then push the knob. The entries are cancelled and the screen returns to the preceding submenu.

Example of a display in the editing mode with one editing line:



9.5.2 Editing Mode with Several Editing Lines

The following example will familiarise you with the menu navigation. You better access the PEQs using the shortcut button. Please read important notes beginning on page 26.

Changing Parameters

In the illustration below, you are at the following menu position:

In → Input1 through **Input4 → PEQ → Filter 1** through **Filter 4:**

Select the line that is to be edited by turning the knob. This line is marked by the arrow. After you push the knob, the underline marks which position of the parameters you are changing while turning the knob.

In the illustration, the underline is under the 10th's place of the Gain parameters (here 00.0). You can change the 10th's place of the parameters by turning the knob. In order to change the ones or the tens places, push the knob and move the blinking cursor to the place which you wish to change. If you push the knob again, the underline indicates the position which you can change by turning the knob. To confirm the entry, push the EXIT button.

Confirm Changes

To confirm the changed settings in the current editing mode, push the EXIT button 2x, and you will return to the previous submenu. The settings are kept until a new setup has been loaded or until the settings have been changed. Changes which have been made less than 10 seconds before the device is shut down are lost after it is turned off. Please wait at least 10 seconds after having made final changes before turning off the controller.

To permanently store the settings, save the setup at: **Setup → Save As.**

The following changes are not saved with a setup and are, therefore, maintained even after a setup has been loaded: InSelect, EQ 31-Band, Display, IP-Address, Units.

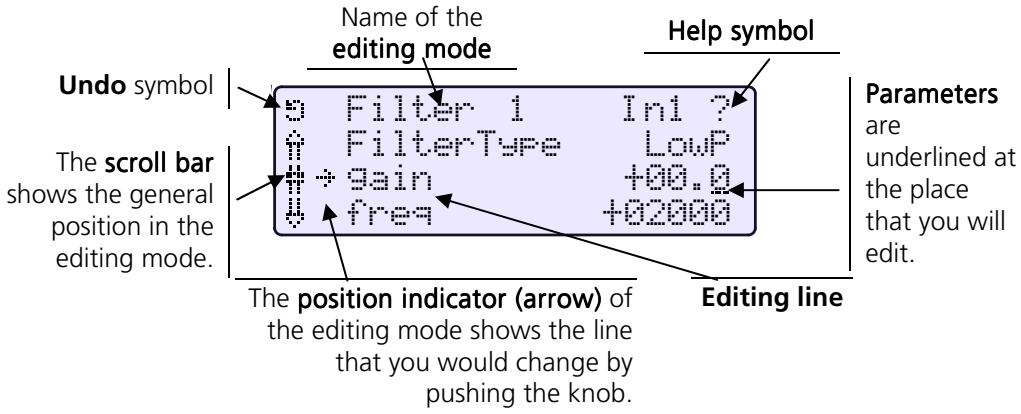
Undo (cancel changes)

To **undo** the changes made in the editing mode, turn the knob to the left until the arrow points to the undo symbol. Then push the knob. The entries are cancelled and the screen returns to the preceding submenu (here: **Input1**).

Help

To get help with the different editing modes, turn the knob to the left until the arrow points to the help symbol (question mark). You can find the appropriate help topic by pushing the knob. Pushing it again returns you to the editing mode. **There is not a help text for every editing mode.**

Example of a display in the editing mode with several editing lines:


Name of the editing mode
Help symbol
Undo symbol
Filter 1 In1 ?
FilterType LowP
gain +00.0
freq +02000
Parameters are underlined at the place that you will edit.
The scroll bar shows the general position in the editing mode.
The position indicator (arrow) of the editing mode shows the line that you would change by pushing the knob.
Editing line

9.5.3 Editing Mode with Selection Lines

In the illustration below, you are at the following menu position:

Util → Routing

Move the position indicator (arrow) to the line that you want to select by turning the knob. Push the knob to choose the selected line. The selection is made and you return to the preceding submenu (here: **Util**).

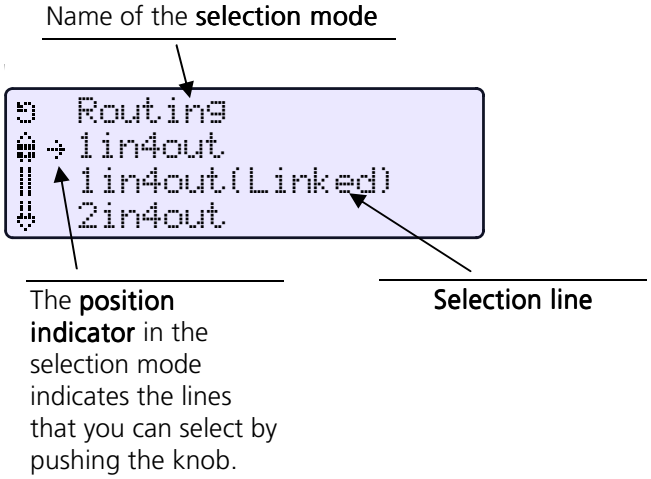
Confirm selection

To confirm the changed selection in the current editing mode, push the knob and you will return to the previous submenu. The selection is kept until a new setup has been loaded or until the selection has been changed. Changes which are made less than 10 seconds before the device is shut down are lost after it has been turned off. Please wait at least 10 seconds after having made the final selection before turning off the controller.

To permanently store the selection, save the setup at: **Setup → Save As.**

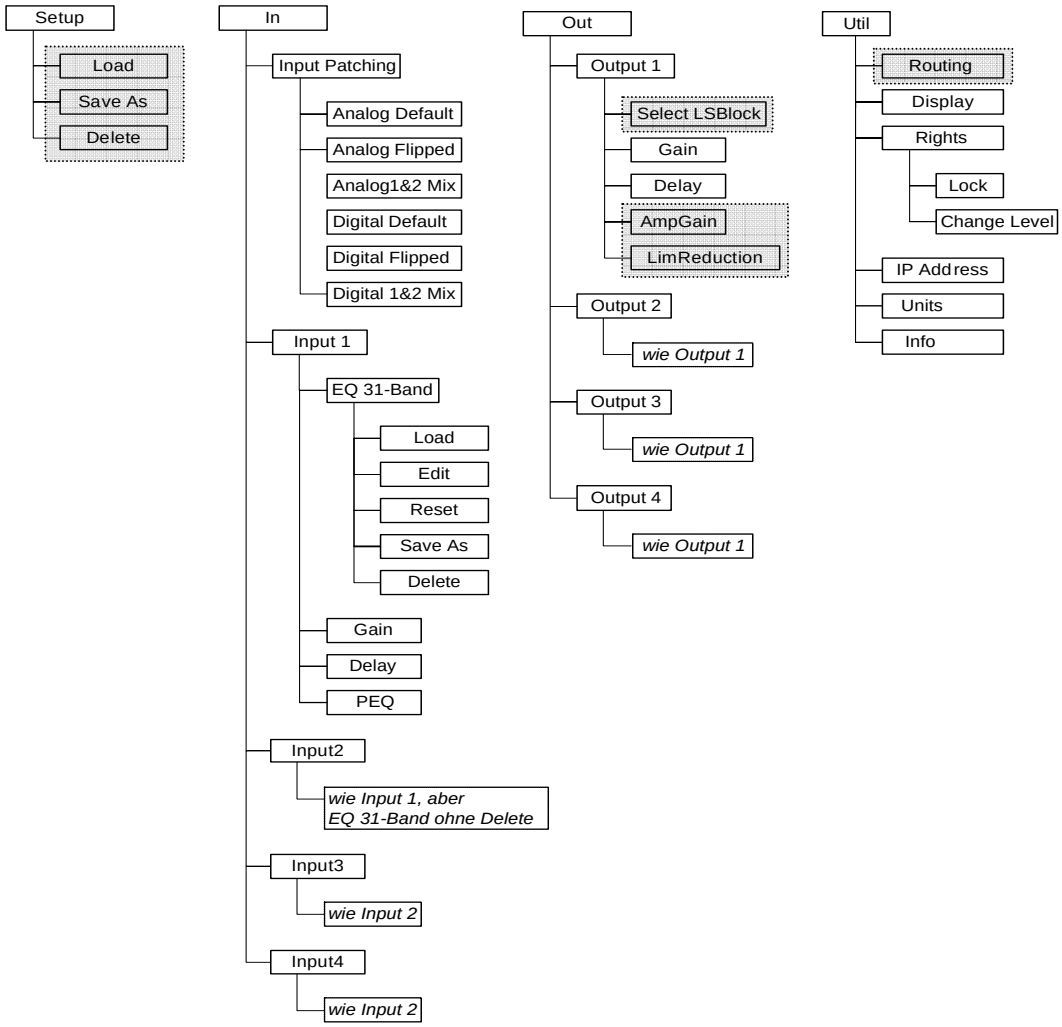
The following changes are not saved with a setup and are, therefore, maintained even after a setup has been loaded: InSelect, EQ 31-Band, Display, IP-Address, Units.

Example of a display in the editing mode with selection lines:


Name of the selection mode
Routing
1in4out
1in4out(Linked)
2in4out
The position indicator in the selection mode indicates the lines that you can select by pushing the knob.
Selection line

9.6 Menu Tree of the CD 44 and Explanation of the Functions

Overview of the CD 44 menu tree.



Not available in User Mode

Detailed instructions about the authorisation modes in chapter: **Functions of the Menu Items under 'Util'** beginning on page 33.

9.6.1 Functions of the Menu Item 'Setup'

The submenu items **Load**, **Save As**, and **Delete** carry out their functions within the named setups. You can save up to 64 setups. To save changed settings permanently, you must save the setup in the main menu **Setup → Save As**!

Approx. 10 seconds after the last change, the CD 44 saves the current status in its memory. This ensures that the changes that you make, even if they are not saved in a setup, are not lost when the device is switched off or if there is a power outage. Please wait at least 10 seconds before turning off the controller to make sure that all settings can be restored after switching the controller on again, including the loading, saving and deleting of setups.

Changes which were not saved in a setup are lost after a new setup has been loaded (**Setup → Load**.

The settings in the following functions do, however, remain after a new setup has been loaded:

- **In → Input1** through **Input4 → EQ 31-Band**
- **Util → Units** *(to switch the delay units from m to ms),*
- **Util → IP Address** *(for network connections n)*
- **Util → Display** *(display contrast)*

Save As

Save under a new name

To save a setup (changed or unchanged) under a new name, select **Setup → Save As** by turning and pushing the knob. Select **<new>**. The name of the current setup appears. Position the arrow under the letters that you wish to change. Turn the knob and select the letter or number by turning the knob. When the desired letter or number is shown, verify the entry by pushing the knob. The arrow automatically jumps to the next letter or number. Continue as described above until you have written the desired name.

By pushing the EXIT button, you save the setup under the name you have defined.

When you have selected **<new>**, it is not possible to save under a previously existing name. The attempt will be answered with the error message **Name exists**.

Overwriting the currently selected setup

To save a changed setup under the same name, activate **Setup → Save As** (turn and push the knob).
The arrow is on the name of the setup that you have just changed. By pushing the knob, you can save your changes.

Overwriting a previously existing setup (not the setup currently selected)

To save a setup under another previously existing name, activate **Setup → Save As** (turn and push the knob).
The arrow is on the name of the current setup. By turning the knob, you can select another previously existing name and save your setup by pushing the knob.

Load

With **Setup → Load** you can call up the saved setups. When loading a new setup, all 31-band EQs (***In → Input1*** *through* ***Input4 → EQ 31-Band****)* are set to Bypass (switched off), but all other settings are maintained.

Delete

With **Setup → Delete**, you delete the saved setups. The currently loaded setup cannot be deleted. Select a setup by turning then pushing the knob. Confirm the deletion by pushing the knob again, or cancel it by pushing the Exit button.

9.6.2 Functions of the Menu Items under 'In'

In the following description the input connectors are named with capital letters (INPUT 1 through INPUT 4). The input sections in the routings are named with bold letters (**Input1** through **Input4**).

The AES/EBU channels are described with left and right (INPUT 1 left/right; INPUT 2 left/right).

The possible settings for the input signals can be set under the menu item 'In'. Depending on which routing you have selected, up to 4 inputs are available for settings (**Input1** through **Input4**):

In → Input Patching:

In Input Patching, you can choose if the CD 44 will be supplied with analogue or digital signals. Furthermore, there is the possibility here to create a mono sum or to exchange input channels. See graphic on next page.

In → Input Patching → Analog Default

The controller is supplied with analogue input signals.

The nominal input level is +6dBu (1.55Vrms).

The maximum input level is +18dBu, that is, the signal peaks must not exceed +18dBu (6V).

In → Input Patching → Analog Flipped

Corresponds to the setting: **In** → Input Patching → Analog Default, but INPUT 1 is exchanged with INPUT 2, and INPUT 3 with INPUT 4.

In → Input Patching → Analog 1&2 Mix

With this setting, the mono sum out of INPUT1 and INPUT2 is created immediately behind the physical inputs. In routings having just one input (i.e. 1 in 4 out), the second input is activated with this setting to create the mono sum of a two channels.

In → Input Patching → Digital Default

The input connectors INPUT 3 and INPUT 4 are not used in this mode!

Make the adjustment In → Input Patching → Digital Default before connecting the digital signal!

To avoid unexpectedly high volume levels, reduce the controller's input gains to a value of approx. –40 dB before you supply these connectors with a digital signal directly from an audio source, and then adjust the level to your needs!

Adjust input gain at: In → Input1 through **Input4 → Gain**

Important

The digital signals which are connected here may have a resolution of 16, 18, 20, or 24 bits and a sampling rate of 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, or 192 kHz.

When using the AES / EBU input, in addition to the system delay of 0.5 ms, a further delay arises from the sample rate converter: With a sample rate of 44.1 kHz = approx. 2.4 ms. With a sample rate 48 kHz = approx. 2.2 ms. With a sample rate 88.2 kHz = approx. 1.5 ms. With a sample rate 96 kHz = approx. 1.4 ms. Further instructions in dealing with the data transmission process AES / EBU can be found in chapter **Instructions for AES / EBU Data Transmission** on page 61.

In → Input Patching → Digital Flipped

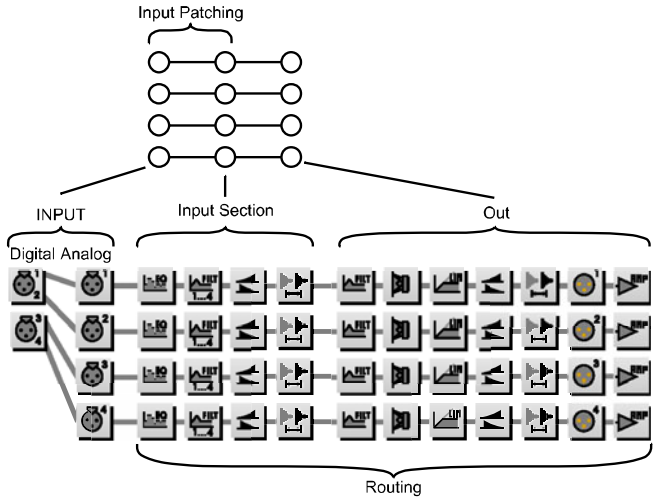
Corresponds to the setting: **In → Input Patching → Digital Default**, but the signals have a crossover routing. So what was previously the **left** signal becomes the **right**, and vice versa. Exchanging the pins 2 and 3 has no effect.

In → Input Patching → Digital 1&2 Mix

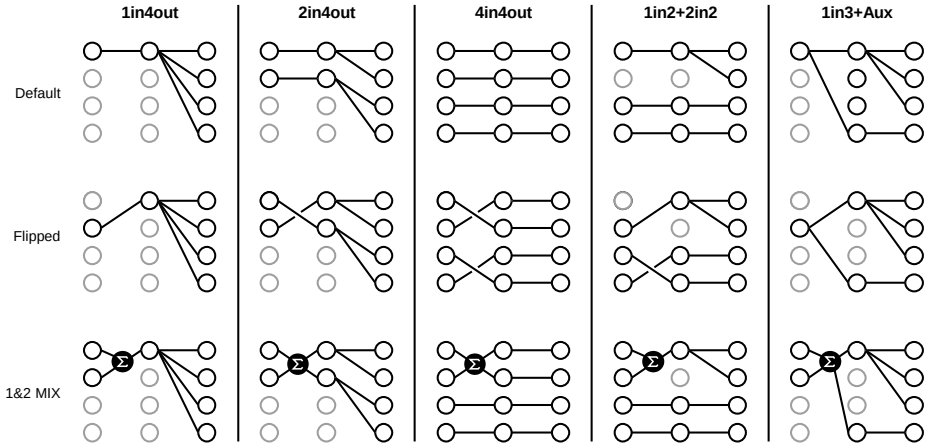
With this setting, the mono sum out of AES/EBU INPUT1 **left** and **right** is created immediately behind the physical inputs. In routings having just one input (i.e. 1 in 4 out), **left** and **right** are activated with this setting to create the mono sum of a stereo signal.

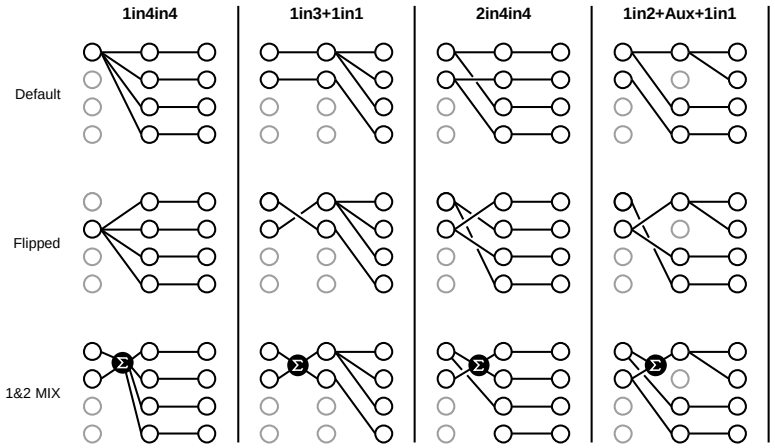
Illustration of the different Input Patchings

Definition:



The routings 1 in 4 out (linked) and 2 in 4 out (linked) are not shown subsequently. With these routings, linked means that channel 1 is linked to channel 3, and channel 2 to channel 4 in the output section (Out). With 2 in 4 out (linked), channel 1 is also linked to channel 2 in the input section (but not **EQ 31-Band).** You must only adjust the settings one time per channel pair.





In → Input1 through **Input4 →**

EQ 31-Band

This is a graphic one-third-octave band equalizer with 31 bands from 20 Hz - 20 kHz. It serves as a system equalizer, i.e. to adjust the speaker frequencies to the room conditions. It can also be used to eliminate feedback during monitor use.

The adjustments are not saved in the **Setup**, but rather in separate **EQ setups** *(Pay attention to the different meanings of Setup / EQ Setup!).* Up to 16 EQ setups can be saved. This makes it possible to access and use a saved EQ setup within the different setups.

When loading a new setup, all EQs are set to 'Bypass' (switched off). To switch the EQs on again, select:

In → Input1 through **Input4 → EQ 31-Band → Edit → Bypass On**.

All other settings are maintained.

Submenus in EQ 31-Band:

With the submenus **Load**, **Edit**, **Reset**, **Save As** and **Delete** you can – irrespective of the setup – access, edit, reset, save, and delete EQ setups.

With this, you can load different EQs in addition to a setup (i.e. same use at different locations).

Load

Used to load named EQ setups.

Select the desired setup (position indicator) by turning and pushing the knob.

Edit

Used to edit named EQ-Setups.

Here you can edit the 31 bands of the one-third-octave band equalizer.

Furthermore, you can set the EQ to **Bypass** . With the setting **Bypass**, the EQ is by-passed and thus does not influence the signal. This function is, for example, advisable when evaluating the before/after effect when editing the EQs.

Save As

Used to save the changes in named EQ setups.

- **In → Input1** through **Input4 → EQ 31-Band → Save As** (turn and push the knob). Select **<new>** by turning the knob, push the knob twice, and select the first letter or number by turning the knob. If the desired letter or number is shown, then verify the entry by pushing the knob. The position indicator automatically jumps to the next letter or number. Continue as described above until you have written the desired name.

  By pushing the EXIT button, you will save the setup under the name you have defined.
- To save changes in a previously existing EQ setting, activate **In → Input1** through **Input4 → EQ 31-Band → Save As**.
  The position indicator is on the EQ setting that you just edited. Pushing the knob saves the change.

Reset

Used to return all settings in the current EQ setup back to zero. This is advisable if, for example, you are going to create a new EQ setting.

Delete

This function is used to delete named EQ settings. It is accessible at **In → Input1 → EQ 31-Band** only.

In → Input1 through **Input4 →**

Gain (input)
see chapter **Input and Output Gains (Gain Button)** on page 18

Delay (input)
see chapter **Input and Output Delays (Delay Button)** on page 19

PEQ → Filter 1 through **Filter 4** (easier to access with 'Filter A Button').
see chapter **Parametric Filters 'PEQ' + SEQ LShelv (Filter A Button)** as of page 12

9.6.3 Functions of the Menu Items under 'Out'

This is where you can make the possible adjustments for the output signals. Four outputs are available (Out → Output1 through Output 4):

Select LSBlock

This is the position where the controller is informed which Kling & Freitag speaker is connected to which output. The controller then loads the parameters for the speaker-specific:

- adjustment of the volume level (gains) for the optimal connection of the K&F bass systems to all listed K&F tops.
- filters for optimising the frequency response and the feedback prevention.
- limiter settings for operating and malfunction safety.
- high and low pass filters for multiway speaker systems (tops with bass systems).
- phase correction between tops and bass systems in multiway systems.
- bass boost for full-range systems (tops.

A wrong assignment of the LSBlocks may ruin the loudspeakers.

Table with the currently available LS blocks, their ranges of use, and their recommended combination with other LS block.

Name LS Block	Application
AccessB10 120Hz*	ACCESS B10 combined with ACCESS T5 / T9 (without ACCESS B5)
AccessB10 55Hz*	ACCESS B10 combined with ACCESS T5 / T9 and flown ACCESS B5
AccessB10 60Hz*	ACCESS B10 combined with ACCESS T5 / T9 and standing ACCESS B5
AccessB5*	ACCESS B5 combined with ACCESS T5/T9
Access High	High frequency channel for the ACCESS T5 / T9
Access Mid Clus	Mid frequency channel for ACCESS T5 / T9, for clustered flown or standing systems.
Access Mid Sngl	Mid frequency channel for ACCESS T5 / T9, for single standing or flown systems
B10 SubLow	ACCESS B10 combined with speakers of the CA and Line Series and with subwoofer ACCESS B5 or subwoofers of the SW Series. ACCESS B10 combined with flown speakers of the CA and Line Series in full-range mode (FR).
B10*	ACCESS B10 combined with speakers of the CA and Line Series
B5*	ACCESS B5 combined with speakers of the CA and Line Series
CA… or Line 212…2Way	Top speaker combined with bass system
CA… or Line 212…FR	Top speaker in full-range mode (without combined bass system)

See next page for additionally available LSBlocks

* Use the LSBlocks B10 and B5 solely for usages without ACCESS top speakers (i.e. Line 212 or speakers from the CA Series) and the LSBlocks ACCESS B10, ACCESS B10 55Hz, ACCESS B10 60Hz and ACCESS B5 only when ACCESS top speakers are being used.

Name LS Block	Application
SONA 5	Top speaker in full range mode and combined with bass system
SW…(all)	For SW Series subwoofers

Sequenza 10:

Name LS Block	Application	Combination with LSBlock
SW215E SEQ 60Hz	SW215E combined with SEQUENZA 10 N / W in full range operations (FR)	SEQ 10...FR
SEQ 10...FR **SEQ10LF/HF FR in combination with the LSBlock SEQ10LF FR only!**	SEQUENZA a 10 use in full range mode.	SW215E SEQ 60Hz AccessB10 60Hz
SEQ 10...LCut **LSBlock SEQ10LF/HF LCUT in combination with the LSBlock SEQ10LF LCUT only**	SEQUENZA a 10 for maximum level usages: In this operating mode, the cut-off frequency of the Sequenza 10 N / W System is raised to relieve the bass speakers.	SW…(all) AccessB10 120Hz AccessB5. Depending on mounting or rigging location of the systems, the tops or bass speakers must be adjusted with delays to align the phasing of the systems to one another.
SEQ10B	SEQUENZA 10 B in standard mode	SEQ 10...LCut, all other K&F top speakers ...2Way with activated Filter B (Combi Mode)
SEQ10B C-F	SEQUENZA 10 B in normal mode as Cardioid Front, front emitting	
SEQ10B C-R	SEQUENZA 10 B in normal mode as Cardioid Rear, rear emitting	
SEQ10B HC-F	SEQUENZA 10 B in normal mode as Hypercardioid Front, front emitting	
SEQ10B HC-R	SEQUENZA 10 B in normal mode as Hypercardioid Rear, rear emitting	
SEQ10B 60Hz	SEQUENZA 10B in sub-bass mode	SEQ 10...FR, all other K&F top speakers …FR with activated B (Combi Mode)
SEQ10B C-F60Hz	SEQUENZA 10 B in sub-bass mode as Cardioid Front, front emitting	
SEQ10B C-R60Hz	SEQUENZA 10 B in sub-bass mode as Cardioid Rear, rear emitting	
SEQ10B HC-F60Hz	SEQUENZA 10 B in sub-bass mode as Hypercardioid Front, front emitting	
SEQ10B HC-R60Hz	SEQUENZA 10 B in sub-bass mode as Hypercardioid Rear, rear emitting	

Select LSBlock → Flat

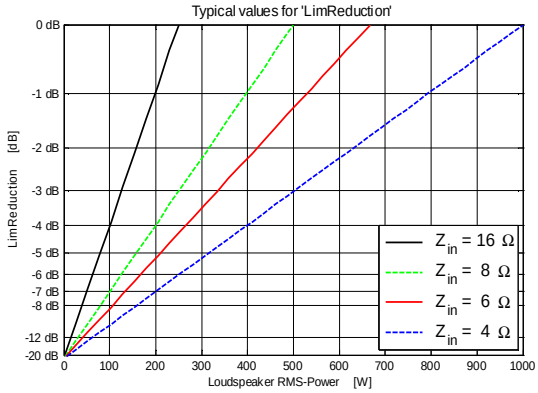
The LSBlock 'Flat' is a distinctive feature. It is intended for special uses such as processing or transmitting line signals, or using third party products or Kling & Freitag speakers where no LSBlock is available. In this LSBlock, all filters are switched off, and there is also no subsonic filter intended! It is still possible, though, to equalise signals with the help of the PEQs and the EQ 31 band.

When using speakers with the LSBlock 'Flat', the limiter must be set at **Out → Output1** through **Output 4 → LimReduction** based on the power ratings (W) of the speakers. You can find the power ratings of the speakers in the information provided by the speaker manufacturer (no liability for misrepresentation). With the following diagram, you can match the power specifications from the speaker manufacturer with the value for LimReduction that we recommend. We, therefore, recommend initially setting the LimReduction lower than recommended, and then carefully approaching the correct setting for the speaker.

Important

The LSBlock 'Flat' is preset for 500W RMS @ 8Ω and 2000W Peak @ 8Ω.

Selected values for LimReduction, depending on the power ratings [W] of the speakers:



Formula: $\mathrm{LimReduction}[\mathrm{dB}] = 10 \times \log_{10}\left(\frac{Z_{LS}[\Omega]}{8\Omega} \times \frac{P_{RMS}[W]}{500\ W}\right)$

Gain (output)

see chapter **Input and Output Gains (Gain Button)** on page 18

Delay (output)

see chapter **Input and Output Delays (Delay Button)** on page 19

AmpGain

This is where the CD 44 shows the determined amplifier gain of the power amplifiers connected to the SENSE / RETURN connectors. After switching off the unit the settings always stay at the last plausibly determined value. As soon as a signal that can be analysed by the controller is applied to the Sense connectors, the controller determines the gain of the connected power amplifier. This value helps the controller to automatically adjust the limiter threshold. The controller continually checks this value and re-adjusts the limiter thresholds automatically, for example, when the gain of the power amplifier is changed manually.

- Amp1 for power amplifier channel at CH1
- Amp2 for power amplifier channel at CH2
- Amp3 for power amplifier channel at CH3
- Amp4 for power amplifier channel at CH4

If you do not use the connectors 'AMP RETURN / SENSE', there is imminent danger that the speakers could be destroyed. Exception: When operating the CD 44 with SP speakers, the AMP RETURN / SENSE inputs are not used, since the SP speakers are equipped with their own limiters. See more on this topic in the chapter SP Speakers on the CD 44 as of page 55.

Important

LimReduction

The limiters have been set during manufacturing so that they provide optimal operating safety and a wide dynamic range when used with adequately sized power amplifiers.

- If power amplifiers are used that are too small, the limiter threshold can be decreased by up to 20 dB so that the power amplifier does not begin to clip.
- For events where a reduction of the sound emissions is legally required, you can adjust the limiter so that the maximum permitted sound level is observed.
- Rental companies can set the limiter lower to protect their speakers from overloads caused by untrained personnel. For example: long-lasting techno events where the speakers can be pushed to their limits.

9.6.4 Functions of the Menu Items under 'Util'

For general settings of the CD 44.

Util →

Routing

This is where you can call up the pre-configured routings in the Controller CD 44.

The routings determine how one or more input signals can be connected to one another and to the outputs, and which route the signals take. When you call up the routings saved in the CD 44, you have the possibility to configure the controller according to the demands of your application.

Familiarise yourself with the routings in order to optimally use the functions such as EQ 31-Band and the long input delays. You can find a detailed explanation under **Routings with Examples of Use and Connecting Diagrams** on page 35.

Display

Here, you can adjust the contrast for the display.

Rights:

The controller differentiates between three different authorization modes which we will, at this point, call User, Master, and Lock Mode.

Lock

If you select the settings **Util → Rights → Lock** no more changes can be made to the controller. This setting serves to completely protect the device from non-authorised persons. To activate this setting, you will be asked for the password. You can enter the User or Master password.

If you would like to unlock the controller, enter your Master or User password at **Util → Rights → Change Level**.

Change Level

To legitimate yourself as a master or user, you must enter the appropriate password at **Util → Rights → Change Level**.

Setting the User password

In the delivery status, the User Mode password is **user** (note lower case!)

If you set the User password, the user has limited rights. This mode is appropriate when you, for example, lend the device and do not want basic changes or adjustments to be made which could compromise the operating safety.

- **Setup** The user may not load, save or delete any setups.
- **Out** he user may not make any changes for **Select LSBlock**, **AmpGain** and **LimReduction**.
- **Util** The user may not change the 'Routing'.

Setting the Master password

In the delivery status, the Master Mode password is **master** ((note lower case!)

If you set the Master password, the user may make any changes except for giving out passwords.

Changing the User and Master password

To change the passwords for the user and master modes, enter the administrator password at **Util → Rights → Change Level**. The Admin Mode password is delivered with the controller in the form of a sticker. We recommend that the owner of the controller changes the user and master passwords before others use it. This ensures that no settings are made by unauthorised persons, which could result in the malfunction or damage of speakers. Please keep the password in a safe place to which unauthorised persons have no access. If this password should get lost, you, as the owner, can request the password at Kling & Freitag after stating the serial number.

IP Address

If you connect the CD 44 to a computer or a network via an Ethernet connection, this is where the communication address of the CD 44 is set. If you want to connect more than one CD 44 to the same network, the IP addresses of the controllers have to be different.

The changed IP address becomes effective only after you disconnect the unit from the power supply and restart it.

Units

The changed IP address becomes effective only after you disconnect the unit from the power supply and restart it.

Info

This is where you can find out the controller's serial number and which version of the software it uses.

10. Routings with Examples of Use and Connecting Diagrams

The usage examples which are mentioned here are saved as preset setups in the controller upon delivery with the names Example1 through Example 14.

When using with ACCESS speakers, we generally recommend using a connector panel from the K&F CP Series. If you do not have this connector panel, you can also connect the ACCESS speaker directly to the controller with the help of this example.

The pre-configured setups in the Controller CD 44 can be accessed at **Setup → Load**.

The routings saved in the CD 44 can be accessed at: **Util → Routing**.

The routings determine how one or several input signals can be linked to one another and to the outputs, and which route the signals take. By calling up the routings saved in the CD 44, you have the possibility to configure the controller to meet the needs of your application.

In the following examples, we will show you the possible routing schemes with corresponding usage examples, including the connecting diagrams for speakers, CD 44, and power amplifiers. The examples only show a very small extract of the range of possible uses. We recommend that you study the routing schemes so that you can choose the correct routing for your application.

The examples given here – 'Example 1' through 'Example 11' as well as 'Example 13' and 'Example 14' – are based on analogue input signals with the input setting:

In → Input Patching → Analog Default.

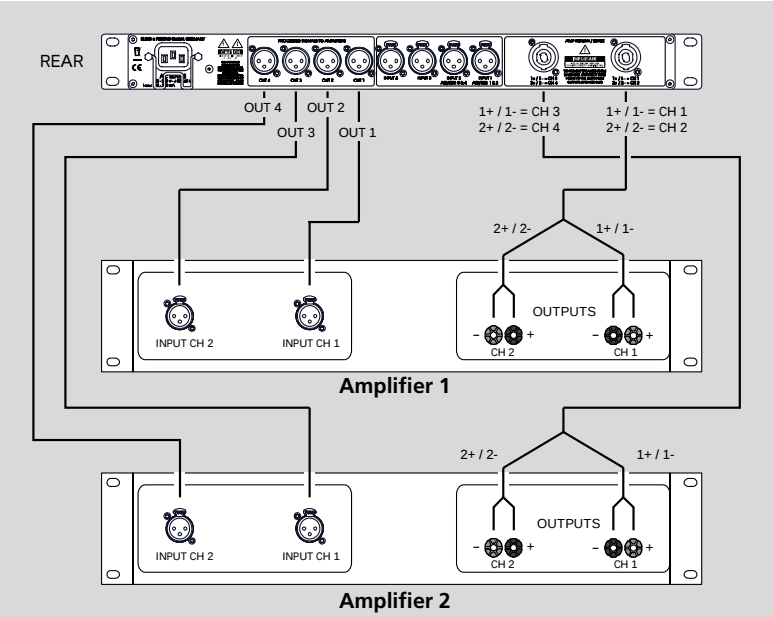
'Example 12' refers to analogue input signals with the setting:

In → Input Patching → Analog.1&2 Mix.

For more, see also Chapter 9.6.2 Functions of the Menu Items under 'In' beginning on page 26.

10.1 'Rack Unit' Connecting Diagram for 1 CD 44 and 2 Amplifiers

All connecting diagrams and setup examples 1-12 and setup example 14 (not example 13, see K&F SystemRack) shown in this manual are based on the following standard diagram for one Controller CD 44 with two power amplifiers, subsequently referred to as 'Rack Unit'.



This 'Rack Unit' is designed for two power amplifiers of the same power ratings.

If you want to use power amplifiers with different specifications in a rack, be sure to wire the rack according to your requirements. Pay special attention to the assignment of the speaker output connectors.

10.2 K&F 'System Rack' Connecting Diagram

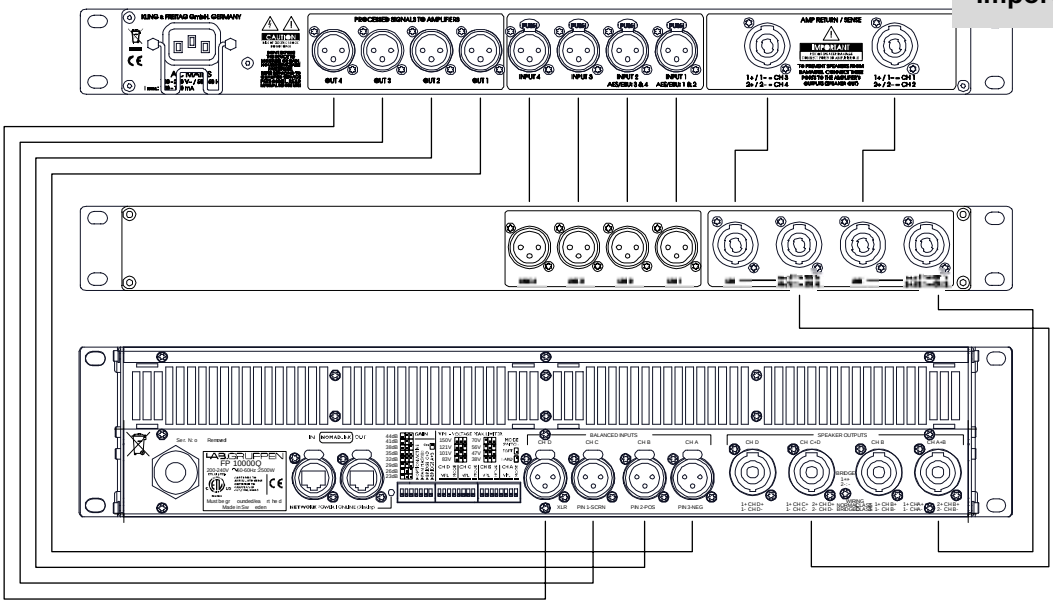
Especially for use with the Sequenza 10 systems on tour, Kling & Freitag recommends setting up K&F system racks with one of each of the following:

K&F controller CD 44 / K&F connector panel CP 4 / power amplifier LAB GRUPPEN FP 10000Q

This system rack is also recommendable for a variety of other uses with Kling & Freitag systems.

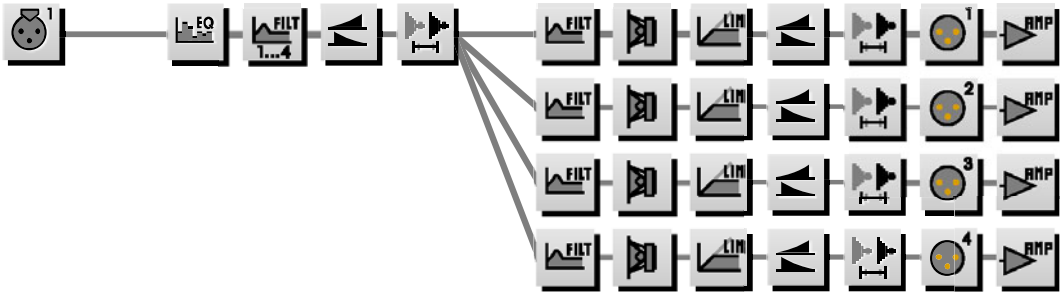
You will find an example of use at Setup Example 13.

When using the Sequenza 10 N / W Systems without the Connector Panel CP 4, the channels for the LSBlocks SEQ10LF/HF (FR or LCUT) and LSBlocks SEQ10LF (FR or LCUT) in the CD 44 must be exchanged with one another! Apparent when you compare setup Example 13 with setup Example14.



10.3 Routing '1 in 4 out' / Setup 'Example 1'

10.3.1 Block Diagram

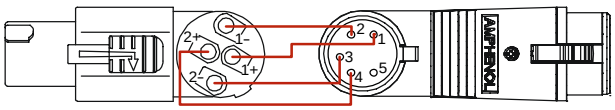


10.3.2 Setup 'Example 1', T5 / T9 with B10 on 2 Channels

Routing '1 in 4 out'

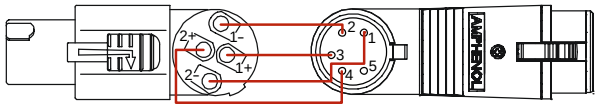
The tops ACCESS T5 / T9 should not be flown without using the subwoofer ACCESS B5. We, therefore, recommend that when the ACCESS T5 / T9 is combined with the ACCESS B10 without ACCESS B5, the top must always be placed on the ACCESS B10.

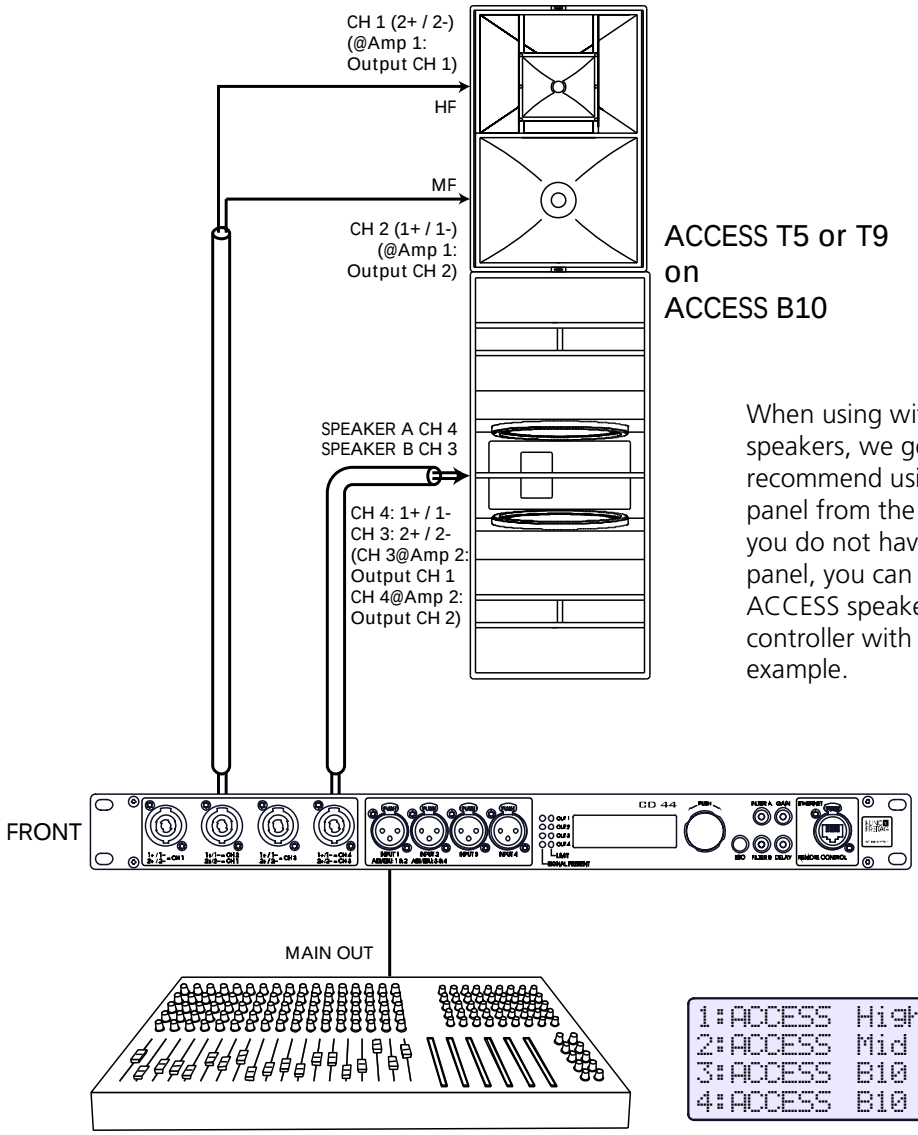
If the ACCESS T5 or T9 is used with EP-5 connectors, we recommend making and using an adapter cable from Speakon to EP-5.



The current versions of the subwoofer ACCESS B5 and ACCESS B10 have a Speakon connector that is assigned to 1+/1- for both chassis. For these versions, you do not need the following adapter! If you want to connect a 1+/1- assigned ACCESS bass, then connect the ACCESS subwoofer like other 1+/1- assigned K&F subwoofers (see relevant examples).

If you use an ACCESS B10 with EP-5 connectors (the same applies to ACCESS B5), we recommend making and using an adapter cable from Speakon to EP-5. This adapter may only be used if you connect the B10 to a Speakon connector of the CD 44 that has only one connected channel. An example where the ACCESS B10 is connected to a CD 44 Speakon connector that is connected on two channels is shown on page 48.



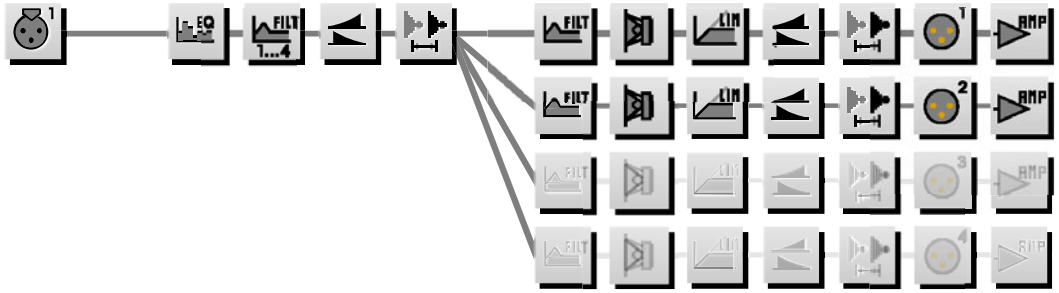


When using with ACCESS speakers, we generally recommend using a connector panel from the K&F CP Series. If you do not have this connector panel, you can also connect the ACCESS speaker directly to the controller with the help of this example.

InfoWindow 2

10.4 Routing '1 in 4 out (Linked)' / Setup 'Example 2'

10.4.1 Block Diagram



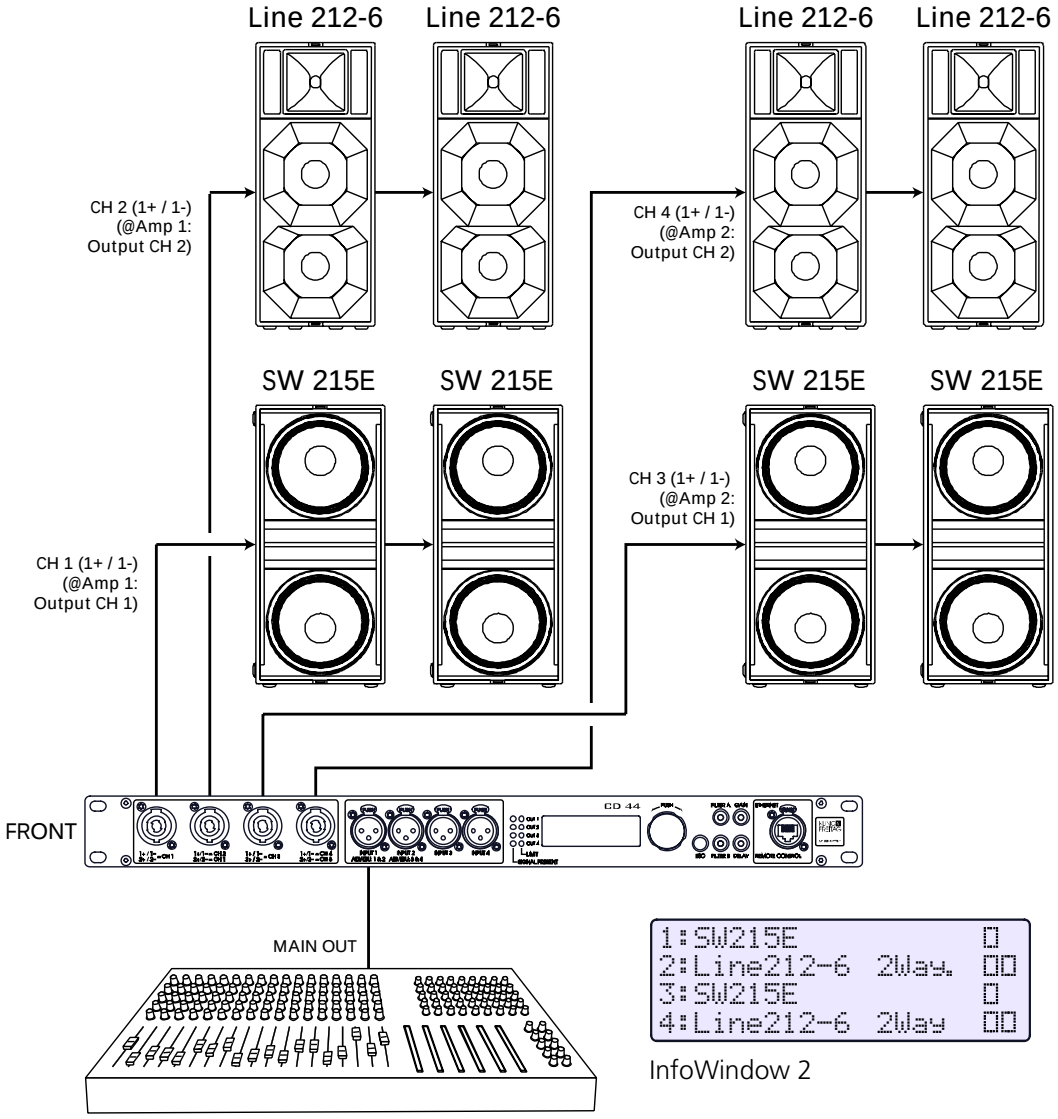
The output section of channel 1 is linked to channel 3
The output section of channel 2 is linked to channel 4

10.4.2 Setup 'Example 2', 4 x Line 212-6 with 4 x SW 215E

Routing '1 in 4 out (linked)'

The advantage of the routing '1 in 4 out' (linked) as opposed to the routing '1 in 4 out' is that you need to adjust the output section for the Line 212 and SW 215E once only.

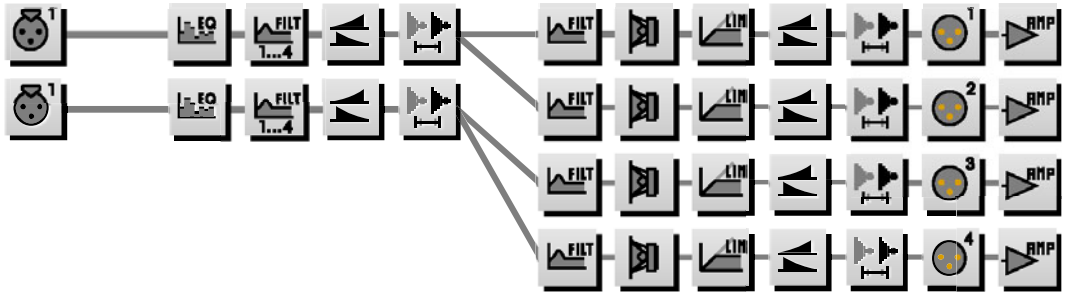
If you want to adjust the output sections differently, then you must select the routing '1 in 4 out!



InfoWindow 2

10.5 Routing '2 in 4 out' / Setup 'Example 3'

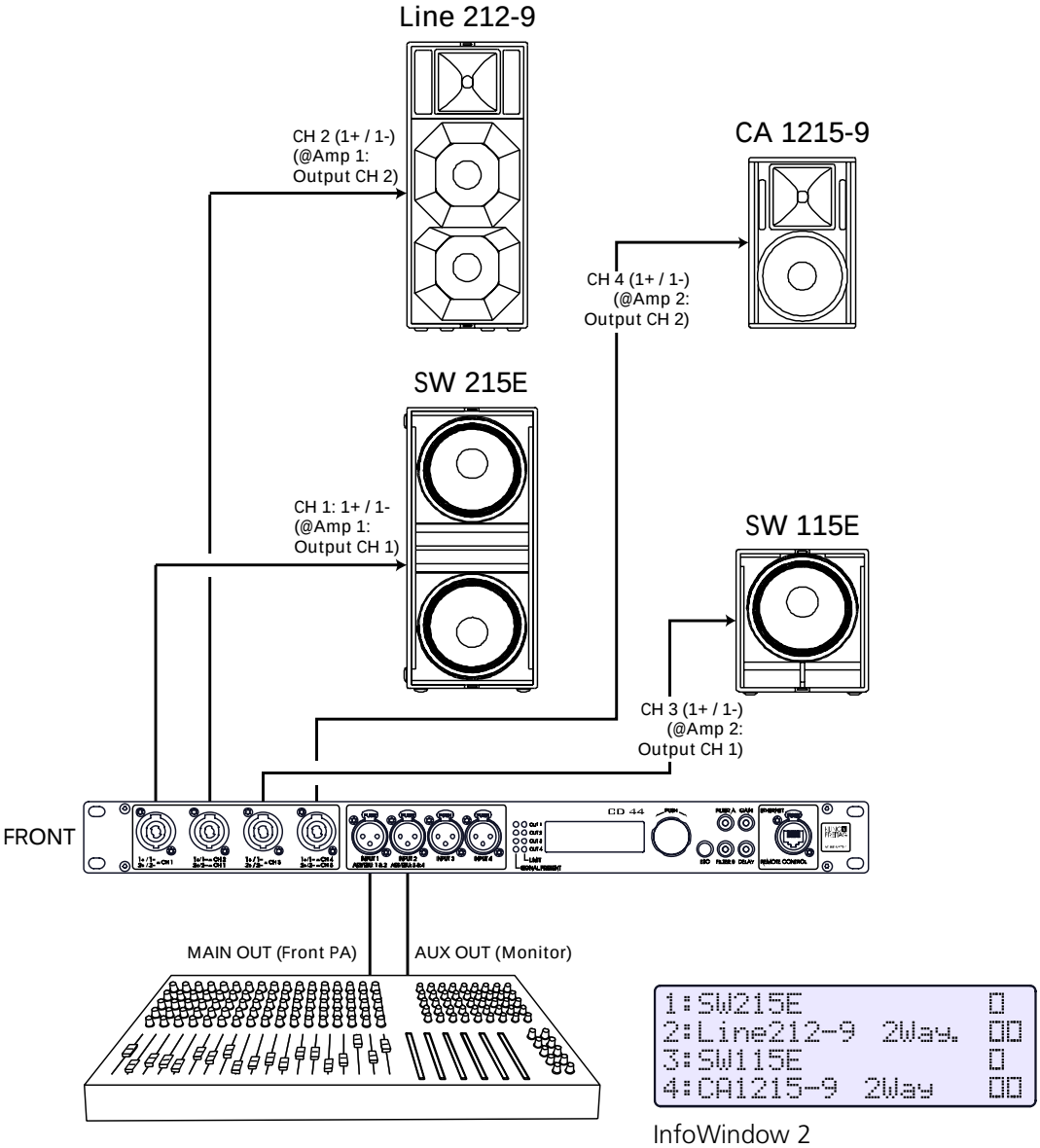
10.5.1 Block Diagram



10.5.2 Setup 'Example 3', Line 212/SW 215E & Monitor CA 1215/SW 115E

Routing '2 in 4 out'

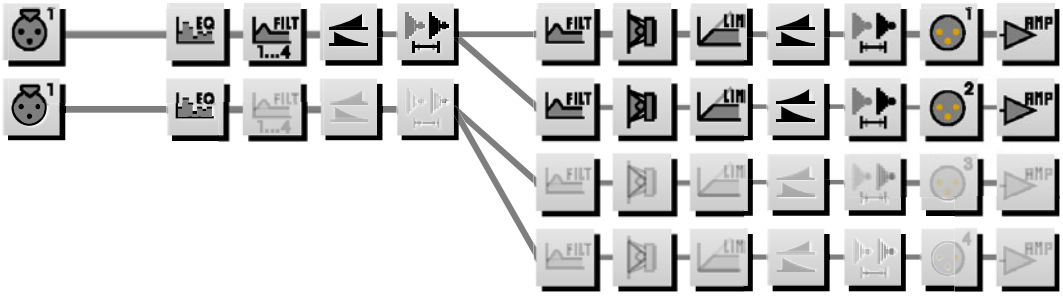
This configuration is suitable for the following example: to control one side of a front PA with top and bass speaker, which are supplied from the Main Out of the mixing console and a monitor (side fill) including a top and bass speaker, supplied from the AUX of the mixing console.



InfoWindow 2

10.6 Routing '2 in 4 out (Linked)' / Setup 'Example 4'

10.6.1 Block Diagram

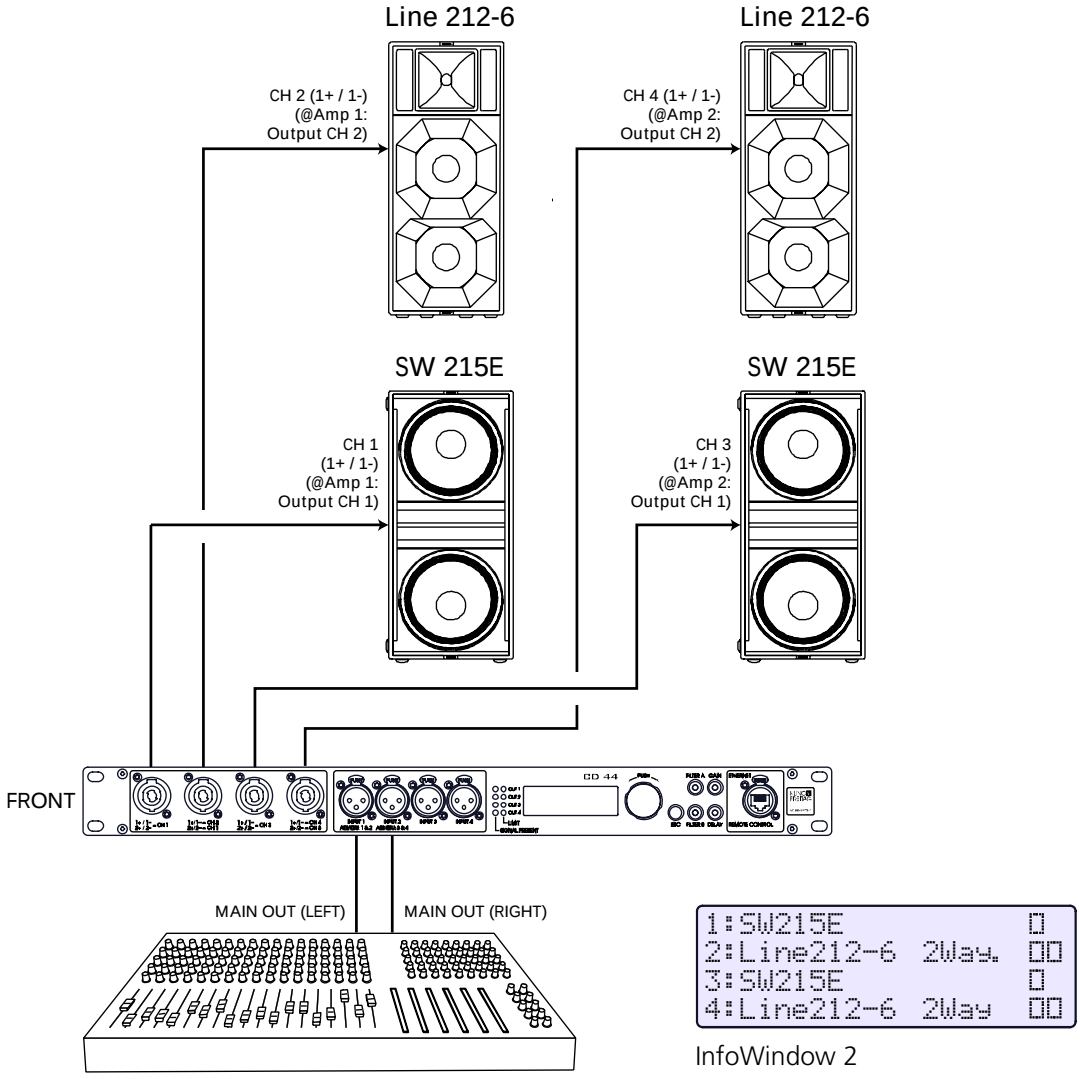


The input section of channel 1 is linked to channel 2 (not **EQ 31-Band**)
The output section of channel 1 is linked to channel 3
The output section of channel 2 is linked to channel 4

10.6.2 Setup 'Example 4', Line 212 / SW 215E, stereo

Routing '2 in 4 out (linked)'

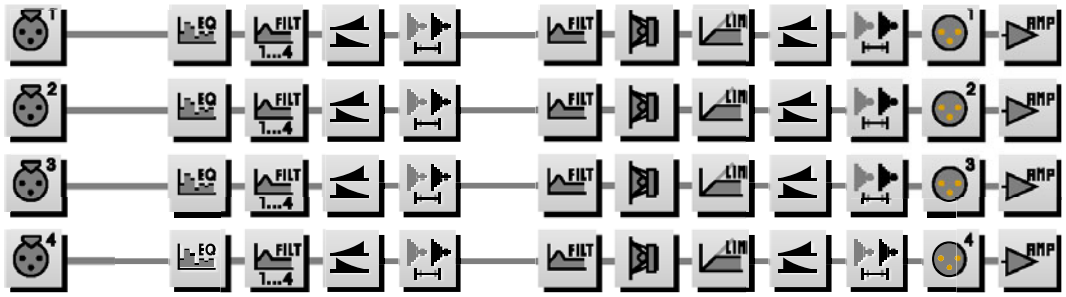
If you want to make separate adjustments for the PEQs and/or the 31-band EQ for stereo use, the routing '2 in 4 out' should be used as the standard setting.



InfoWindow 2

10.7 Routing '4 in 4 out' / Setup 'Example 5'

10.7.1 Block Diagram



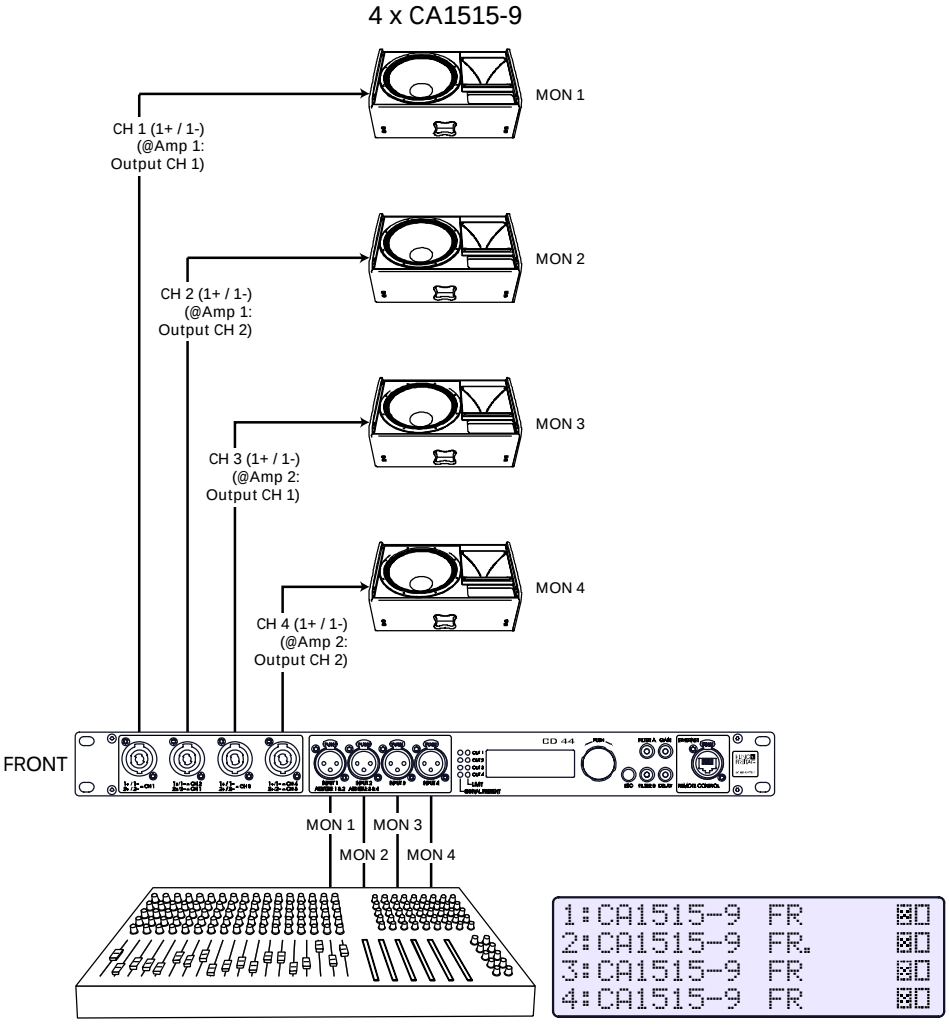
10.7.2 Setup 'Example 5', 4- Way Monitor Setup

Routing '4 in 4 out'

During monitor uses where the speakers are lying on the floor, the Cluster Filter (via Filter B) should be selected.

Accessible with:

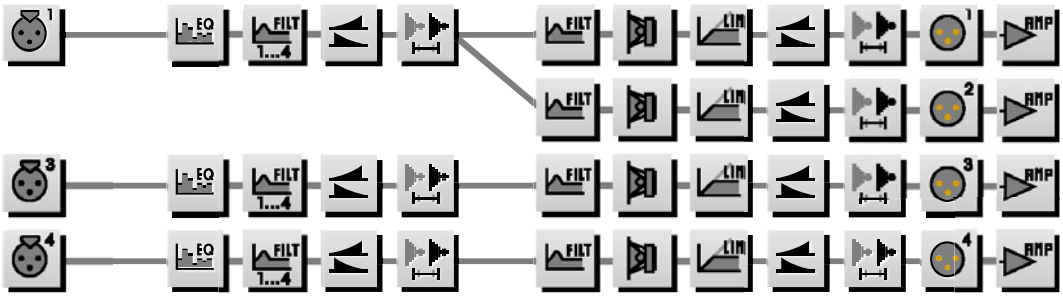
It might make sense to turn the tweeter horns by 90°.



InfoWindow 2

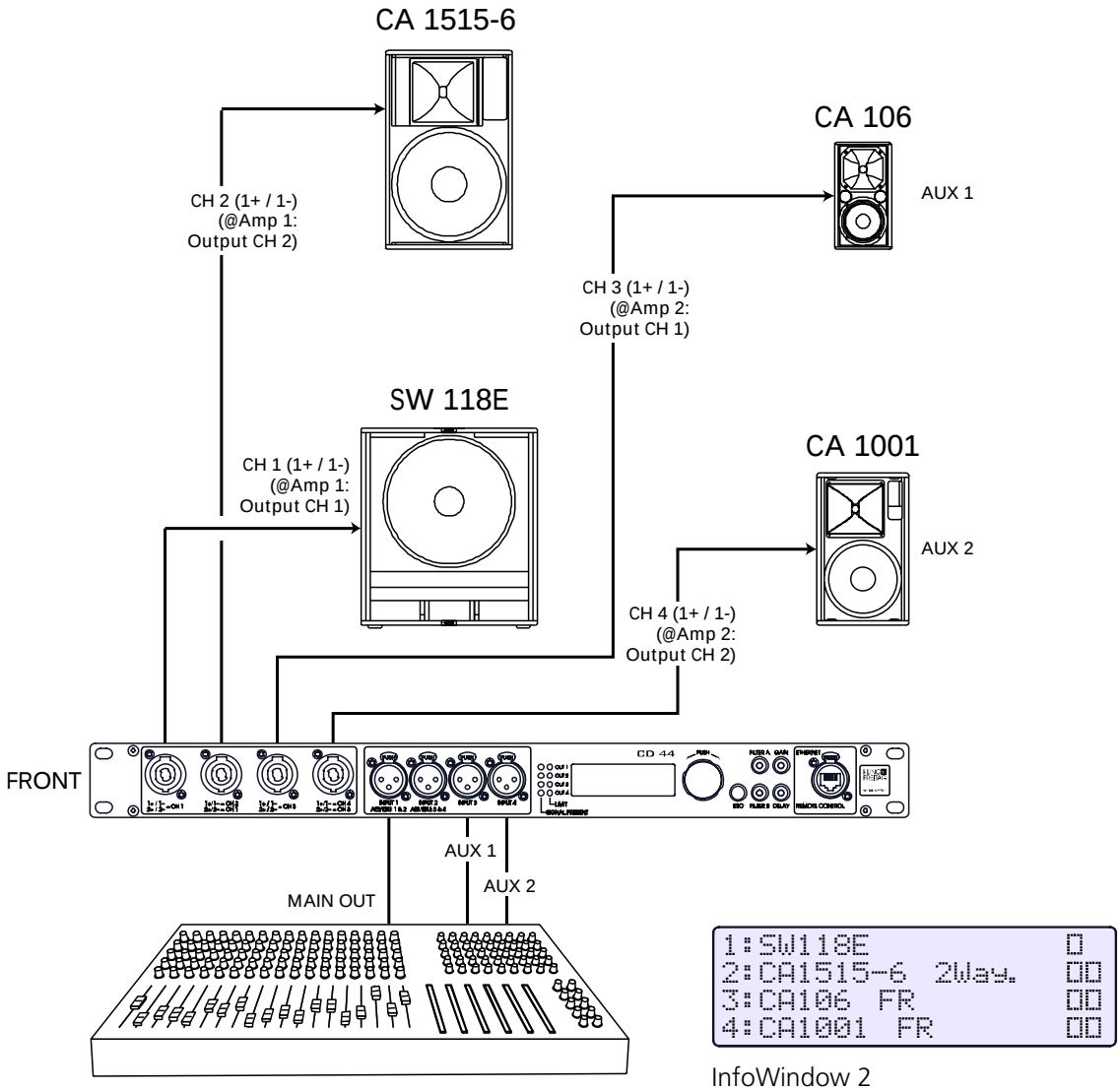
10.8 Routing '1 in 2 + 2 in 2' / Setup 'Example 6'

10.8.1 Block Diagram



10.8.2 Setup 'Example 6', Front: CA1515 / SW118E + 2 Adjoining Rooms

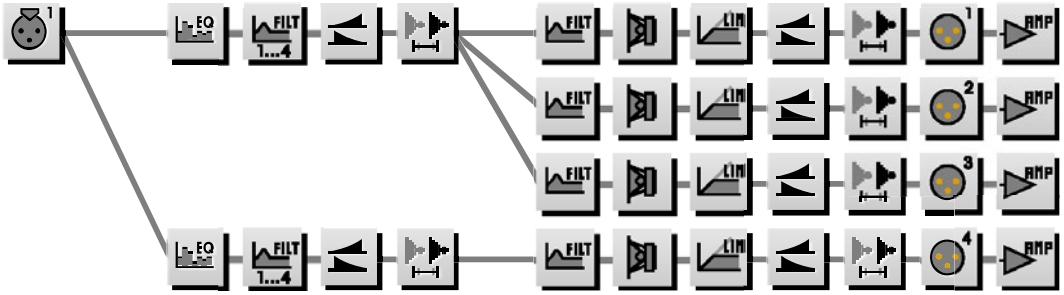
Routing '1 in 2 + 2 in 2'



InfoWindow 2

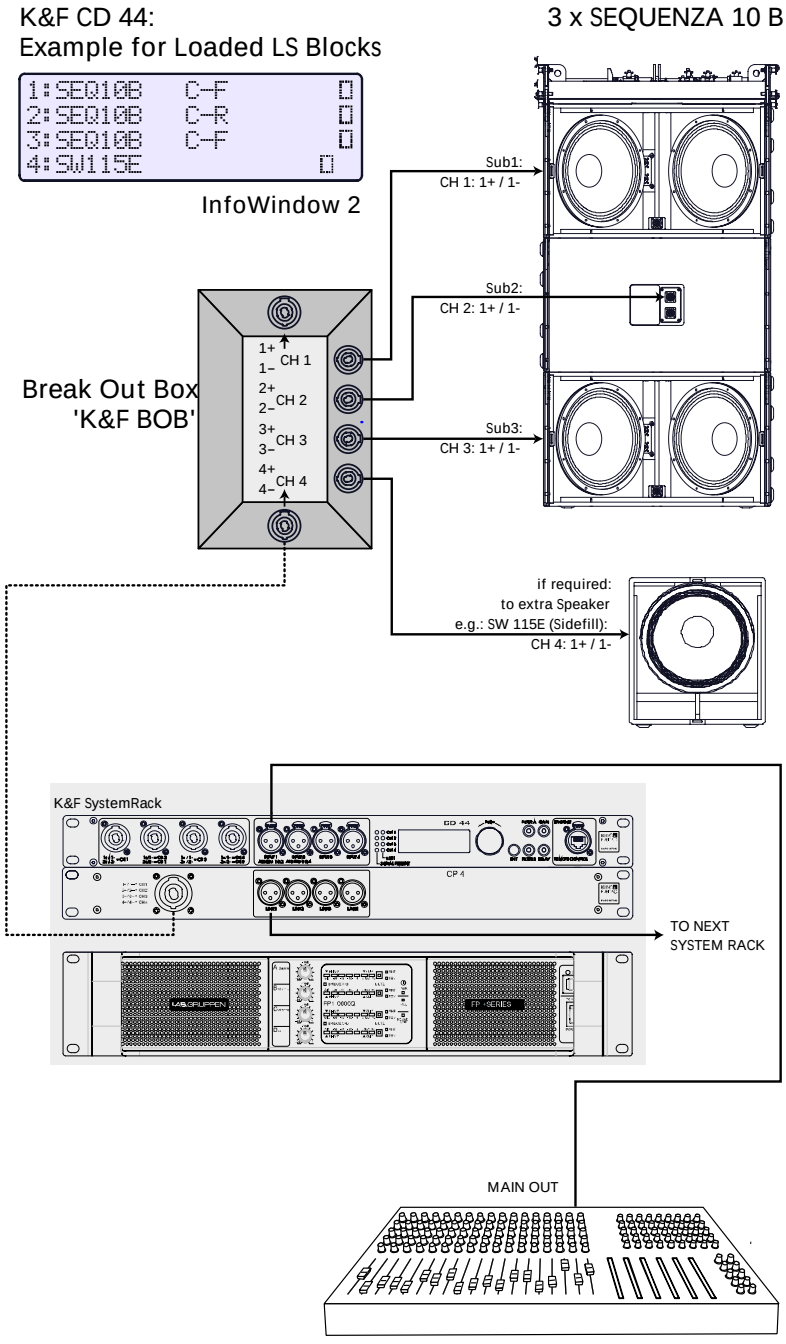
10.9 Routing '1 in 3 + AUX' / Setup 'Example 7'

10.9.1 Block Diagram



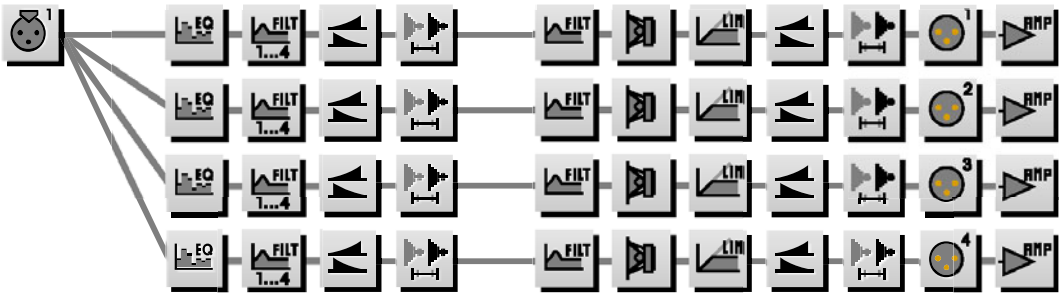
10.9.2 Setup 'Example 7', 3 x SEQUENZA 10 B Cardioid + SW 115 E

The 3 SEQUENZA 10 B's need to be controlled with an identical level and signal. You can achieve this most easily by using the CD 44 routings **1in4out** or **1in3out+AUX.**



10.10 Routing '1 in 4 in 4' / Setup 'Example 8'

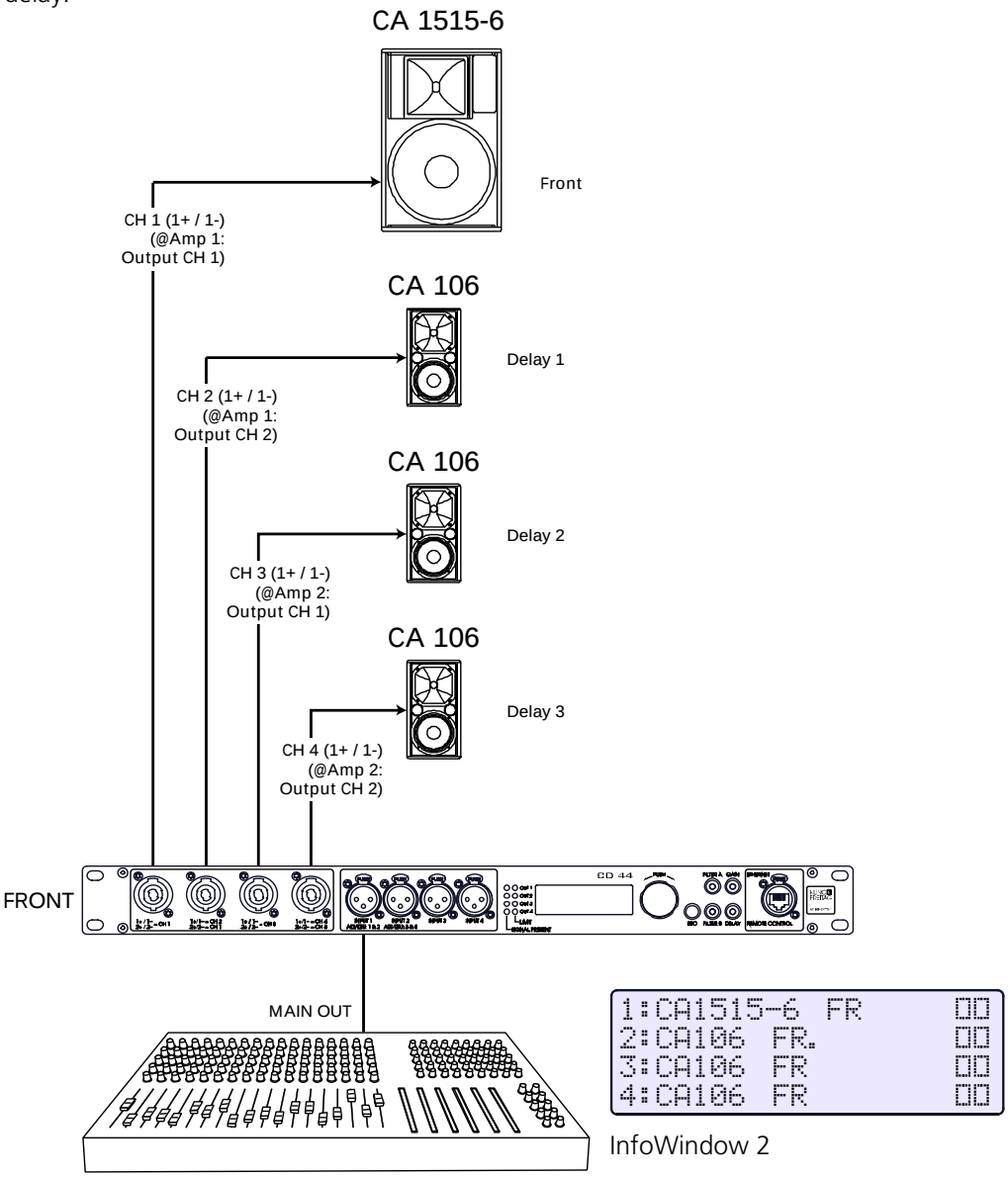
10.10.1 Block Diagram



10.10.2 Setup 'Example 8', Delay-Line

Routing '1 in 4 in 4'

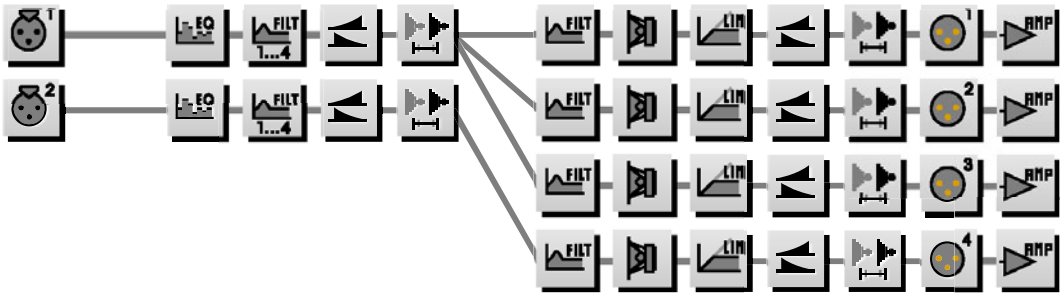
The difference as compared to the routing '1 in 4 out' is that you can make separate adjustments for every channel in the input gains, the PEQs, the EQ 31 Band, and the input delay.



InfoWindow 2

10.11 Routing '1 in 3 + 1 in 1' / Setup 'Example 9'

10.11.1 Block Diagram

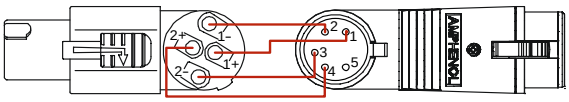


10.11.2 Setup 'Example 9', T5 / T9 with B5 and additional Bass B10

ACCESS setups with additional B10 for a separate deep bass playback of selected signals.

The main out of the mixing console delivers the sum of the signals for the top speakers T5 / T9 as well as for the B5. Selected signals with a high share of deep bass, like bass drum, keyboard, etc. are picked up at the mixing console's AUX path and transmitted to the B10 using a separate controller path.

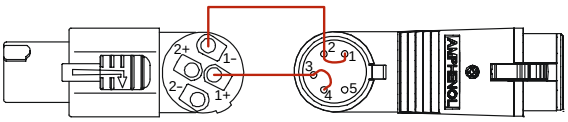
If the ACCESS T5 or T9 is used with EP-5 connectors, we recommend making and using an adapter cable from Speakon to EP-5.



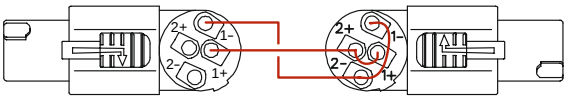
The current versions of the subwoofer ACCESS B5 and ACCESS B10 have a Speakon connector that is assigned to 1+/1- for both chassis. For these versions, you do not need the following adapter! If you want to connect a 1+/1- assigned ACCESS bass, then connect the ACCESS subwoofer like other 1+/1- assigned K&F subwoofers.

ACCESS B10 with EP -5 connector:

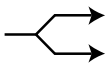
In this example, the B10 is only connected to one channel of the CD 44! A connector is used, though, that supplies 2 channels. When connecting the B10, use a two-core cable with the assignment 1+ and 1-. You should use one of the following adapters at the speaker input of the B10 in order to transmit the signal to both chassis.

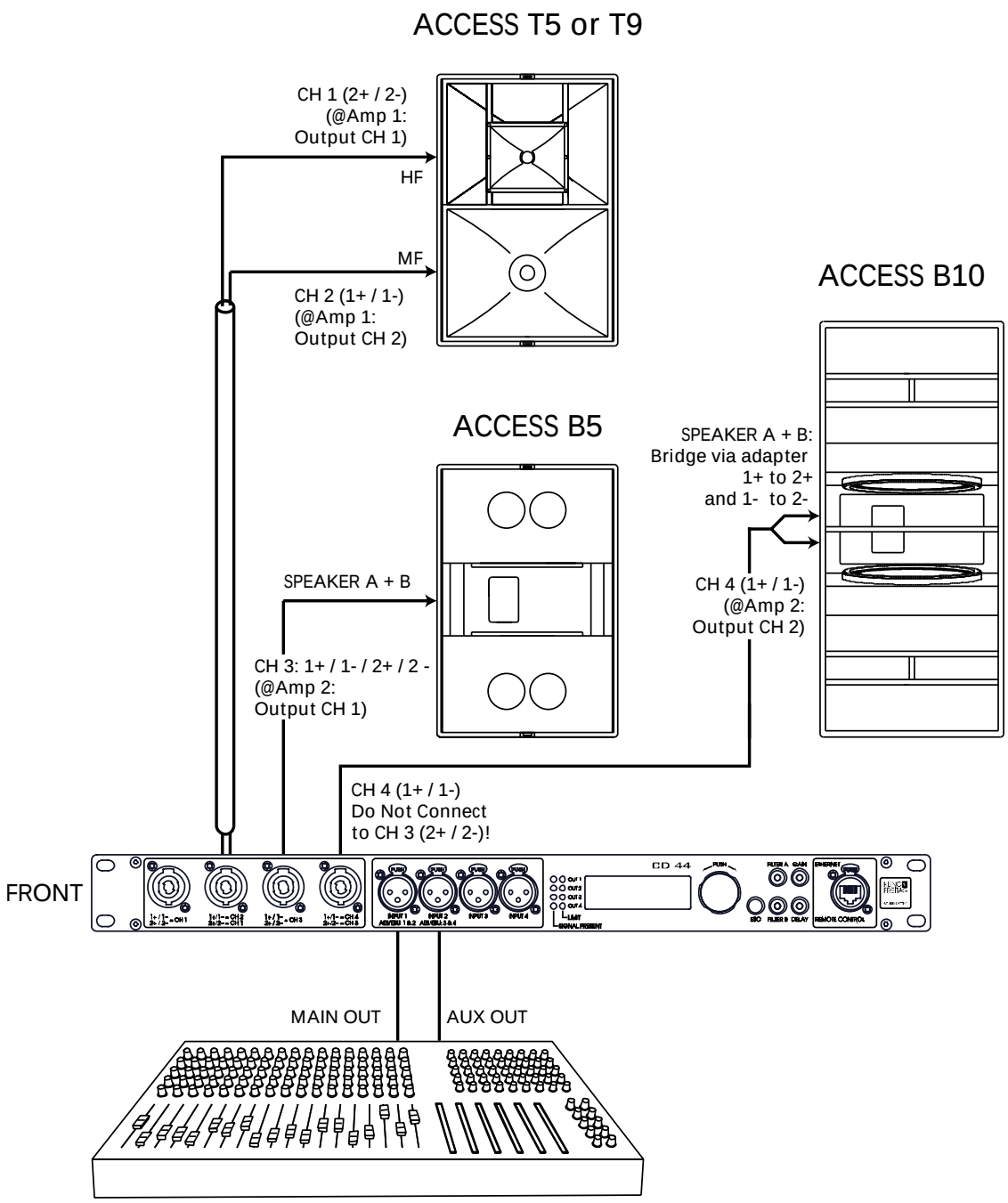


Adapter for ACCESS B10 input with EP-5 connector



Adapter for ACCESS B10 input with Speakon connector

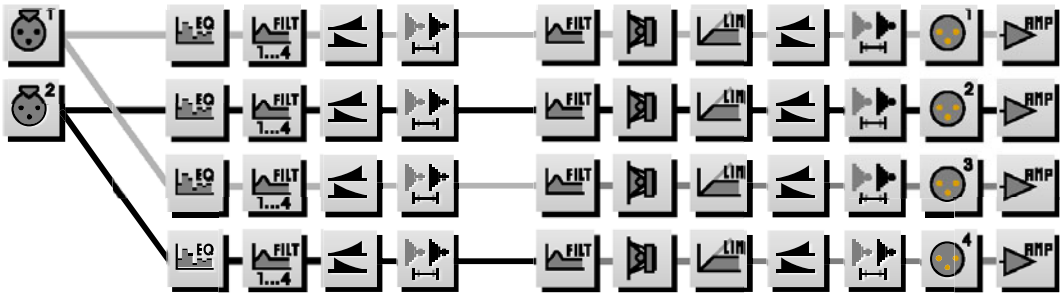
Symbol for the adapter in the connecting diagram: 



InfoWindow 2

10.12 Routing '2 in 4 in 4' / Setup 'Example 10'

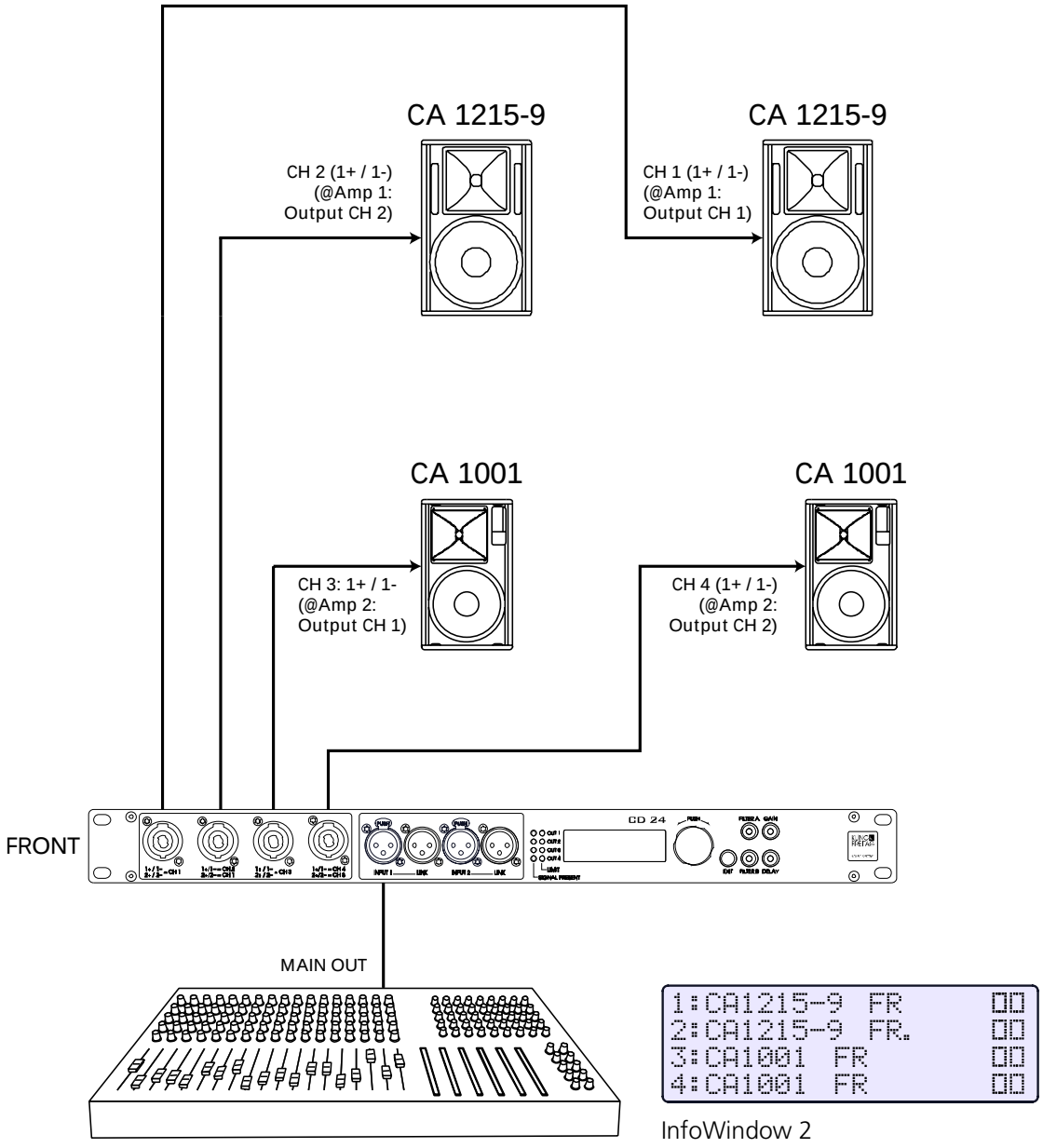
10.12.1 Block Diagram



10.12.2 Setup 'Example 10

Ch1+2 = Main sound system, stereo

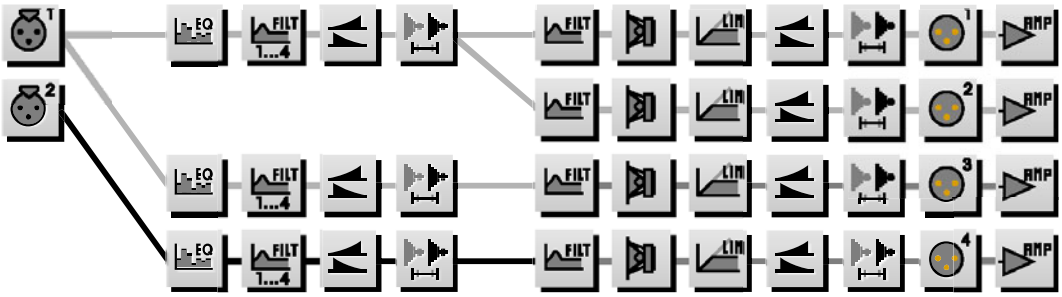
Ch3+4 = Sound system in adjoining room, stereo



InfoWindow 2

10.13 Routing '1 in 2 + Aux + 1 in 1' / Setup 'Example 11'

10.13.1 Block Diagram

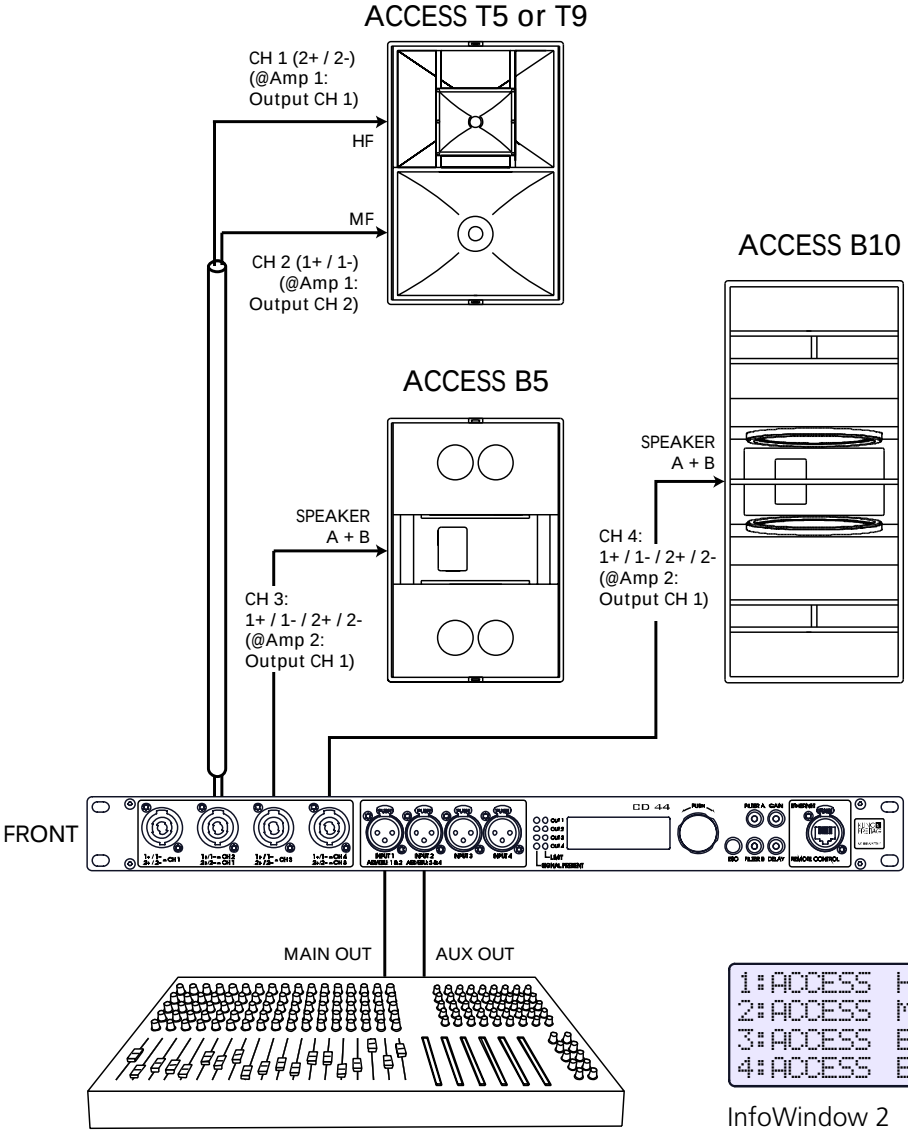


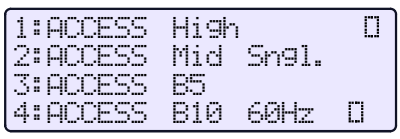
10.13.2 Setup 'Example 11

Ch1+2 = Access top speaker

Ch3 = B5 with separate filter settings

Ch4 = B10 from separate mixing console output

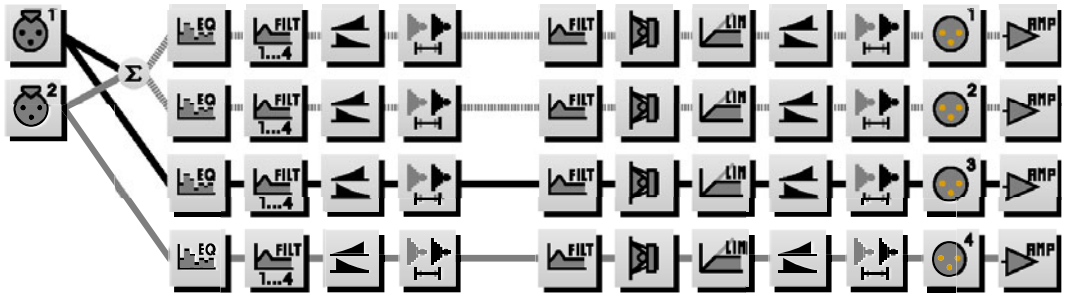




InfoWindow 2

10.14 Patching: Analog 1&2 Mix / Routing '2 in 4 in 4' / Setup 'Example 12

10.14.1 Block Diagram

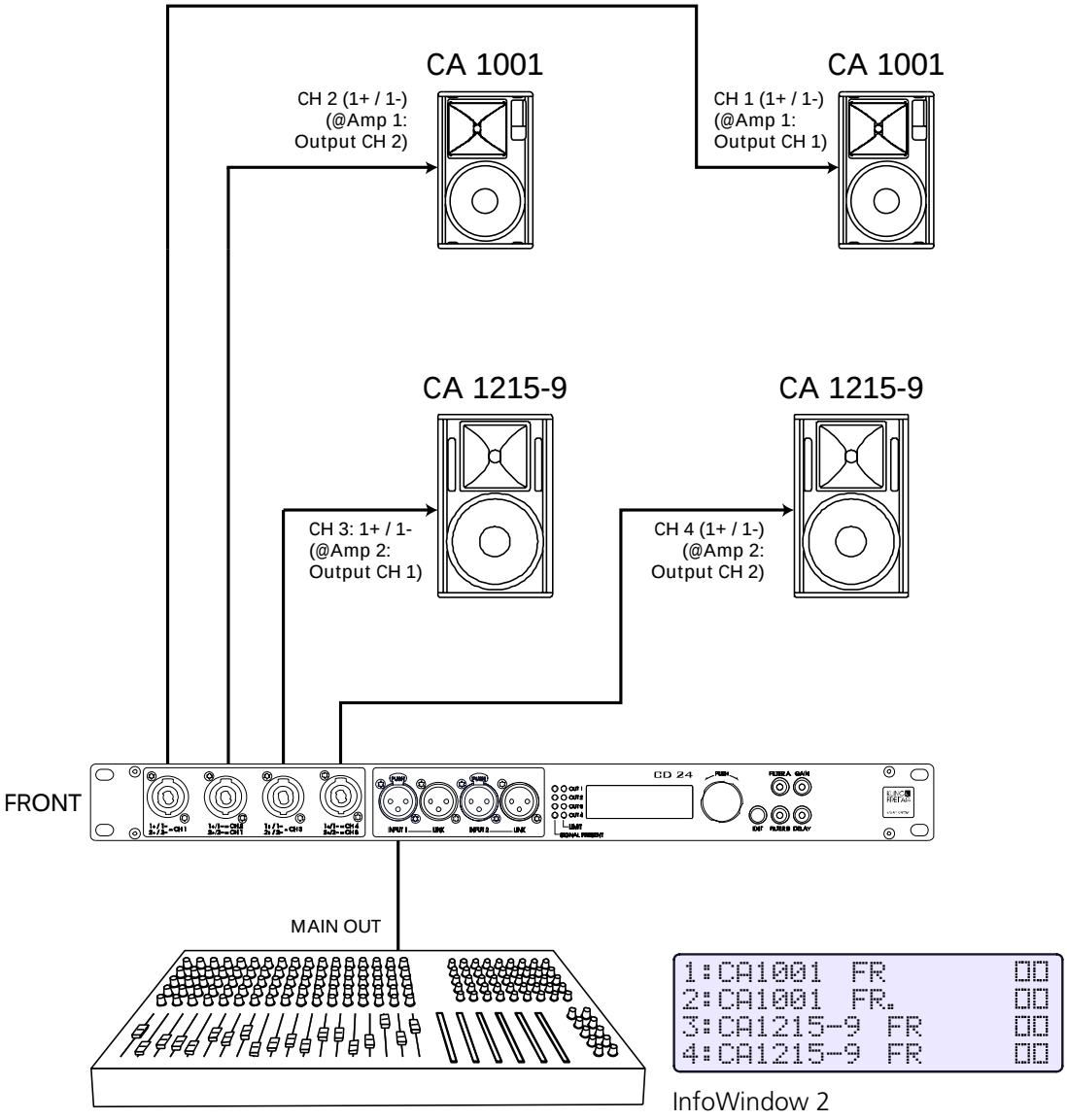


10.14.2 Setup 'Example 12

Ch1 = Sound system in adjoining room 1, mono (i.e. foyer)

Ch2 = Sound system in adjoining room 2, mono (i.e. cafeteria)

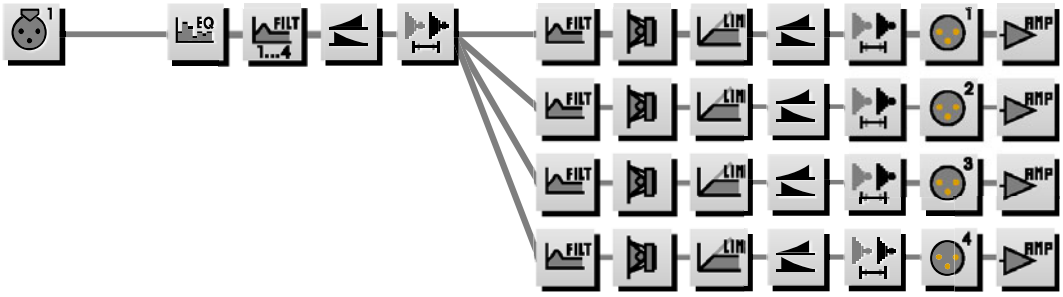
Ch3+4 = Main sound system, stereo



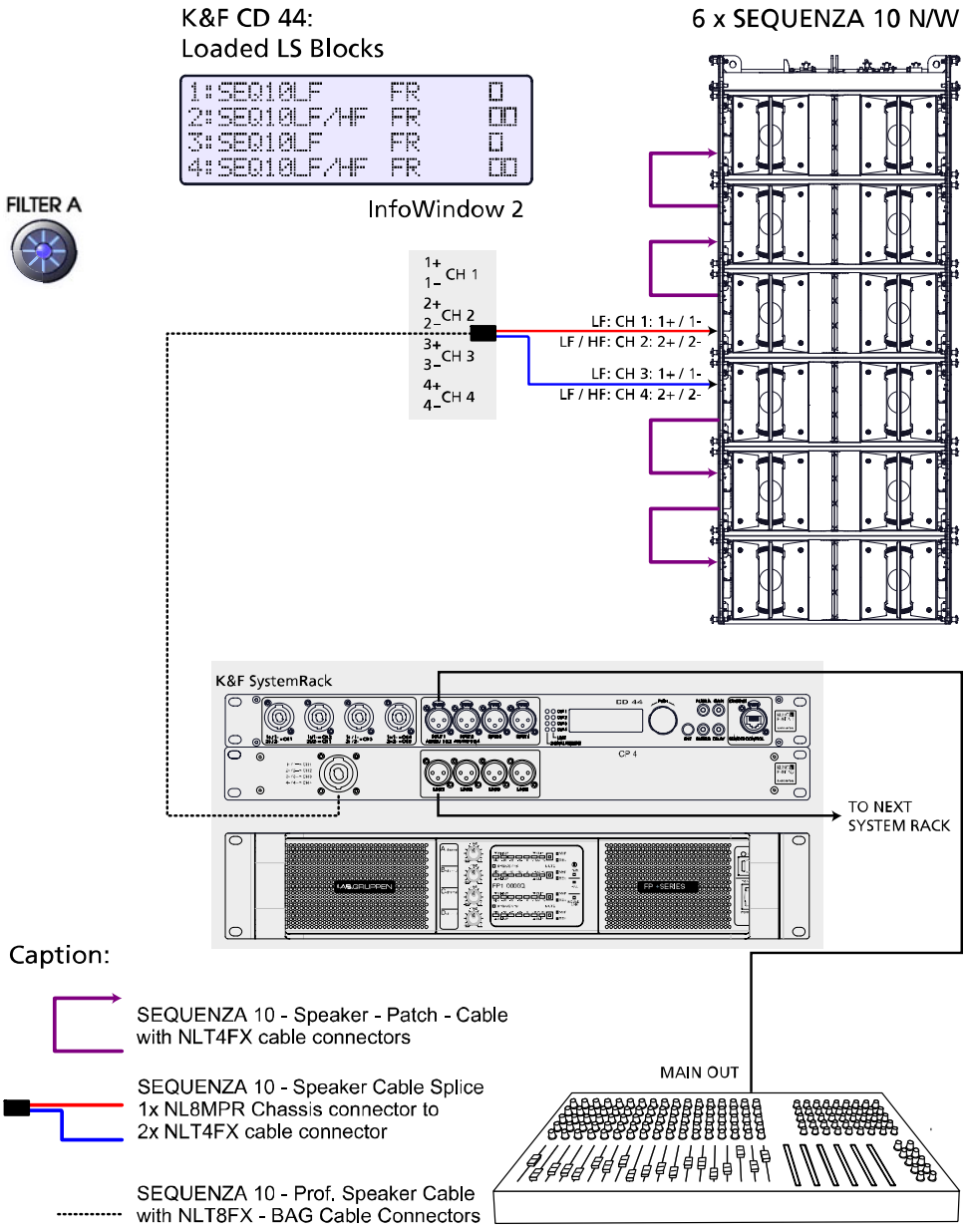
InfoWindow 2

10.15 Sequenza 10 N / W Routing '1 in 4 out' / Setup 'Example 13'

10.15.1 Block Diagram

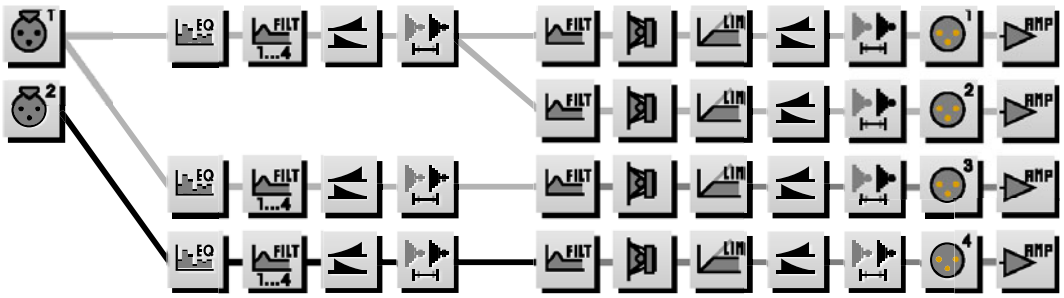


10.15.2 Setup 'Example 13'


K&F CD 44:
Loaded LS Blocks
1:SEQ10LF FR
2:SEQ10LF/HF FR
3:SEQ10LF FR
4:SEQ10LF/HF FR
InfoWindow 2
6 x SEQUENZA 10 N/W
FILTER A
1+ 1– CH 1
2+ 2– CH 2
3+ 3– CH 3
4+ 4– CH 4
LF: CH 1: 1+ / 1-
LF / HF: CH 2: 2+ / 2-
LF: CH 3: 1+ / 1-
LF / HF: CH 4: 2+ / 2-
K&F SystemRack
TO NEXT SYSTEM RACK
MAIN OUT
Caption:
SEQUENZA 10 - Speaker - Patch - Cable with NLT4FX cable connectors
SEQUENZA 10 - Speaker Cable Splice 1x NL8MPR Chassis connector to 2x NLT4FX cable connector
SEQUENZA 10 - Prof. Speaker Cable with NLT8FX - BAG Cable Connectors

10.16 Sequenza 10 N / W: Routing '1 in 2 + Aux + 1 in 1' / Setup 'Example 14'

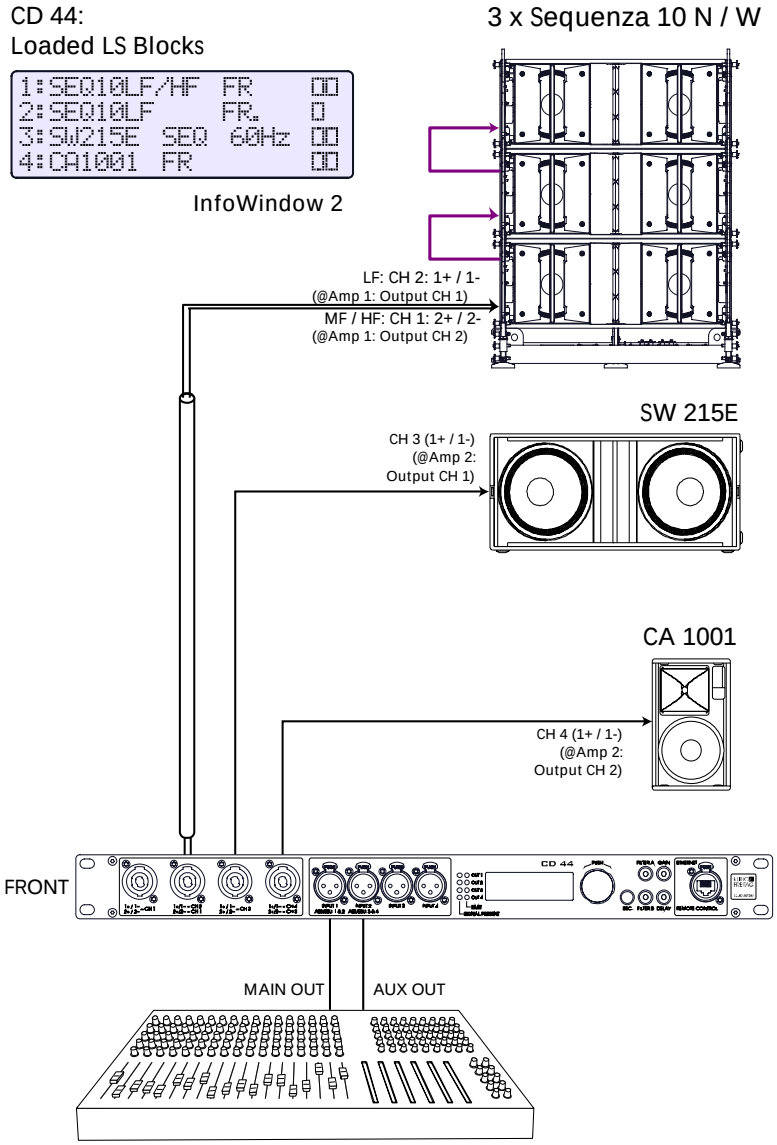
10.16.1 Block Diagram



10.16.2 Setup 'Example 14'

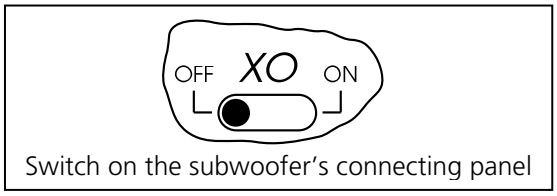
When using the Sequenza 10 N / W Systems without the Connector Panel CP 4, the channels for the LSBlocks SEQ10LF/HF (FR or LCUT) and LSBlocks SEQ10LF (FR or LCUT) in the CD 44 must be exchanged with one another! Apparent when you compare setup Example 13 with setup Example14. Please see chapter 8.1 on page 8.

Important



11. Subwoofer with integrated Crossover on the CD 44

When using subwoofers with integrated crossover on the CD 44, set the XO switch on the connecting terminal of the subwoofer to XO 'OFF'.



Switch on the subwoofer's connecting panel

We do not recommend the passive use of a subwoofer at a top speaker (XO 'ON') on the CD 44.

12. SP Speakers on the CD 44

Important

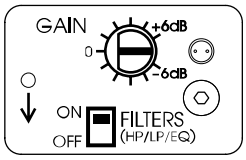
The line inputs of the SP speakers are only connected with the desired outputs of the controller (Out 1 through Out 4). Connecting the amplified signal to the connector AMP RETURN / SENSE of the CD 44 is not possible with an SP speaker. This is not necessary, though, because the SP speaker is equipped with its own limiters guaranteeing the operating safety.

If you do not wish to use the limiter in the CD 44, set up the AmpGain as followed: **Out → Output 1** through **Output 4 → AmpGain → Gain/dB: +20.0** (lowest possible value).

If you also wish to use the limiter in the CD 44, i.e. for level limiting, then you must set the AmpGain to **+30.0**. With this setting, you can select the desired level limit at **Out → Output 1** through **Output 4 → LimitReduction**.

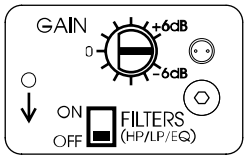
You can use the SP speakers in two different ways on the CD 44:

1. **With the LSBlock 'Flat'**:
   With this, the overlap filter characteristic of the SP speaker is maintained. In this case, move the switch **'FILTERS'** in the connecting panel of the SP speaker to **'ON'** and the **Gain** potentiometer to **0 dB**.



Switch on the SP speaker's connecting panel

2. **With the LSBlock of the respective K&F speaker system:**
   With this, you can use the filter characteristic for the passive speaker. In this case, select the LSBlock which goes with your SP speaker. For example, select the LSBlock CA 1201 2Way for 2-way operations of the speaker CA 1201-SP, or the CA 1201 FR for full-range use. Move the switch **'FILTERS'** in the connecting panel of the SP speaker to **'OFF'** and turn the **Gain** potentiometer on the connecting panel of the SP speaker to **0 dB**.



Switch on the SP speaker's connecting panel

13. Recommendations for Configuration

13.1 Operating several Speakers per CD 44 Channel

The maximum number of speakers which can be operated at one time using the CD 44 Controller is limited by the minimum output impedance of the power amplifiers.

Make sure the power amplifier has sufficient headroom.

No further adjustments need to be made to the CD 44 Controller when operating with several speakers connected to a single controller. There is no need to adjust the limiters. They receive the necessary information via the voltage applied (not via the current).

SP speakers: Up to 50 SP speakers can be connected to one channel.

13.2 The correct Level Balance between Bass and Top Speakers

When setting up the system it is very important to ensure that the volume levels of the tops and bass systems are correctly balanced.

The sound level of arrayed bass speakers increases by max. +6dB when doubling the number of speakers (+3dB efficiency plus 3dB by doubling the power amplifier level). The loudness of the tops increases in a different manner because of the directivity.

A bass speaker which is on the floor can be a few decibels louder than a flown bass system because of the floor reflections.

With the CD 44, you can adjust this level balance to meet the requirements of different configurations and applications.

In order to intuitively set the output gain, it is important to remember that the output gain must always be set at 0 dB for the following speaker combinations (applies to systems placed on the floor):

- **1 small top and a subwoofer with one chassis**
- **1 large top and a subwoofer with two chassis**
- **ACCESS top T5 or T9 with 2 x ACCESS B5 or 2 x ACCESS B10**

CA 106 and CA 1001 are regarded as small tops. All other tops with available LSBlock, except the ACCESS, are considered to be large top.

The following tables show how this relationship is to be set for the particular configurations. In doing so, it also considers if the systems are flown or placed on the floor.

The data given apply to bass systems placed on the floor and are valid on the condition that all systems are driven by identical power amplifiers with the signals set at the same level (we recommend maximum level)).

When using power amplifiers with different gain characteristics it can become necessary to adjust the balance between top and bass system using the output gain control of the CD 44.

Depending upon room acoustics and geometry the correct settings may well differ in practice from that given here. For this reason the sound engineer should always carry out a fine adjustment.

13.2.1 SW 112 / SW 115D / SW 115E / SW 118E

Prerequisite:

– identical power amplifiers for tops and bass systems with identical volume settings.
– bass systems placed on the floor.

1 Subwoofer with 1 Top

TOP / SUB		
	1 x CA 106	**1 x CA 1201**
		1 x CA 1215
	1 x CA 1001	**1 x CA 1515**
		1 x Line 212
1 x SW 112	Output gain for subwoofer*	Output gain for subwoofer*
1 x SW 115D / SW 115E	Output1 → Gain/dB: +00.0	Output1 → Gain/dB: +06.0
1 x SW 118E	Accessible with: GAIN	Accessible with: GAIN

Switch off 'Cluster' (via Filter B) for tops and subwoofers*

Cluster →Out1 ?
→ Status: off

Accessible with: FILTER B

*Output1 / Out 1 as an example. Select the output which is connected to the speaker!

1 Subwoofer with 2 Tops

TOP TOP / SUB		
	2 x CA 106	**2 x CA 1201**
		2 x CA 1215
	2 x CA 1001	**2 x CA 1515**
		2 x Line 212
1 x SW 112	Output gain for subwoofer *	Output gain for subwoofer *
1 x SW 115D / SW 115E	Output1 → Gain/dB: +03.0 Accessible with: GAIN	Output1 → Gain/dB: +09.0 Accessible with: GAIN
1 x SW 118E		**Only recommended for applications with low bass level required!**

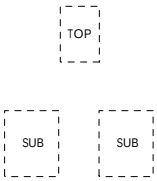
Switch on 'Cluster' (via Filter B) for tops and subwoofer, when the tops are placed on the subwoofer *

Cluster →Out1 ?
→ Status: on

Accessible with: FILTER B

* Output1 / Out1 as an example. Select the output which is connected to the speaker!

2 Subwoofers with 1 Top



	1 x CA 106	**1 x CA 1201**
		1 x CA 1215
	1 x CA 1001	**1 x CA 1515**
		1 x Line 212
2 x SW 112 **2 x SW 115D / SW 115E**	Output gain for subwoofer* Output1 Gain/dB: -06.0	Output gain for subwoofer* Output1 Gain/dB: +00.0
2 x SW 118E	Accessible with: GAIN	Accessible with: GAIN

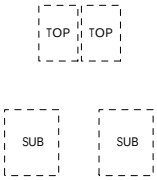
Switch off 'Cluster' (via Filter B) for tops and subwoofers*

Cluster ->Out1 ?
Status: off

Accessible with: FILTER B

* Output1 / Out1 as an example. Select the output which is connected to the speaker!

2 Subwoofers with 2 Tops



	2 x CA 106	**2 x CA 1201**
		2 x CA 1215
	2 x CA 1001	**2 x CA 1515**
		2 x Line 212
2 x SW 112 **2 x SW 115D / SW 115E**	Output gain for subwoofer* Output1 Gain/dB: -3.0	Output gain for subwoofer* Output1 Gain/dB: +03.0
2 x SW 118E	Accessible with: GAIN	Accessible with: GAIN

Switch on 'Cluster' (via Filter B) for tops and subwoofer, when the tops are placed on the sub-woofer *

Cluster ->Out1 ?
Status: on

Accessible with: FILTER B

* Output1 / Out1 as an example. Select the output which is connected to the speaker!

13.2.2 SW 215E / SW 215D / ACCESS B5 / ACCESS B10 / SEQUENZA 10 B

Prerequisite:

– identical power amplifiers for tops and bass systems with each amplifier set at the same volume.
– bass systems placed on the floor.

1 Subwoofer with 1 Top

	1 x CA 106	**1 x CA 1201**
		1 x CA 1215
	1 x CA1001	**1 x CA 1515**
		1 x Line 212

1 x SW 215D	Output gain for subwoofer *	Output gain for subwoofer *
1 x SW 215E	Output1 Gain/dB: -06.0	Output1 Gain/dB: +00.0
1 x ACCESS B5		
1 x ACCESS B10		
1 x SEQUENZA 10 B (in 'Combi Mode', switchable via Filter B)	Accessible with: GAIN	Accessible with: GAIN

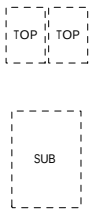
Switch off 'Cluster' (via Filter B) for top and subwoofer *

Cluster ->Out1 ?
Status: off

Accessible with: FILTER B

* Output1 / Out1 as an example. Select the output which is connected to the speaker!

1 Subwoofer with 2 Tops



	2 x CA 106	**2 x CA 1201**
		2 x CA 1215
	2 x CA1001	**2 x CA 1515**
		2 x Line 212

1 x SW 215D	Output gain for subwoofer *	Output gain for subwoofer *
1 x SW 215E	Output1 Gain/dB: -3.0	Output1 Gain/dB: +03.0
1 x ACCESS B5		
1 x ACCESS B10		
1 x SEQUENZA 10 B (in 'Combi Mode', switchable via Filter B)	Accessible with: GAIN	Accessible with: GAIN

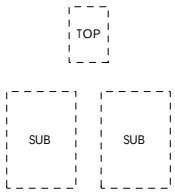
Switch on 'Cluster' (via Filter B) for tops and subwoofer, when the tops are placed on the subwoofer *

Cluster ->Out1 ?
Status: on

Accessible with: FILTER B

* Output1 / Out1 as an example. Select the output which is connected to the speaker!

2 Subwoofers with 1 Top



	1 x CA 106	**1 x CA 1201**
		1 x CA 1215
	1 x CA1001	**1 x CA 1515**
		1 x Line 212
2 x SW 215D	**Not generally recommended!**	
2 x SW 215E	Output gain for subwoofer *	Output gain for subwoofer *
2 x ACCESS B5	Output1 Gain/dB: -12.0	Output1 Gain/dB: -06.0
2 x ACCESS B10		
1 x SEQUENZA 10 B (in 'Combi Mode', switchable via Filter B)	Accessible with: GAIN	Accessible with: GAIN

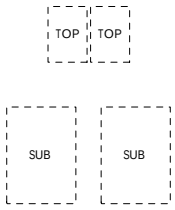
Switch off 'Cluster' (via Filter B) for top and subwoofers *

Cluster ->Out1 ?
Status: off

Accessible with: FILTER B

* Output1 / Out1 as an example. Select the output which is connected to the speaker!

2 Subwoofers with 2 Tops



	2 x CA 106	**2 x CA 1201**
		2 x CA 1215
	2 x CA1001	**2 x CA 1515**
		2 x Line 212
2 x SW 215D	**Not generally recommended!**	
2 x SW 215E	Output gain for subwoofer *	Output gain for subwoofer *
2 x ACCESS B5	Output1 Gain/dB: -9.0	Output1 Gain/dB: -3.0
2 x ACCESS B10		
1 x SEQUENZA 10 B (in 'Combi Mode', switchable via Filter B)	Accessible with: GAIN	Accessible with: GAIN

Switch on 'Cluster' (via Filter B) for tops and subwoofer, when the tops are placed on the sub-woofer *

Cluster ->Out1 ?
Status: on

Accessible with: FILTER B

* Output1 / Out1 as an example. Select the output which is connected to the speaker!

14. Instructions for AES / EBU Data Transmission

14.1 General Instructions

The interface AES / EBU offers the possibility to transmit two digital audio channels via a balanced cable. The sampling rate of the audio signal may be 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz or 192 kHz with a resolution of max. 24 bits. The Kling & Freitag CD 44 System Controller supports any type of sampling rates ranging from 44.1 kHz to 192 kHz with a resolution of max. 24 bits.

When using the AES / EBU input, in addition to the system delay of 0.5 ms, a further delay arises from the sample rate converter: With a sample rate of 44.1 kHz = approx. 2.4 ms. With a sample rate 48 kHz = approx. 2.2 ms. With a sample rate 88.2 kHz = approx. 1.5 ms. With a sample rate 96 kHz = approx. 1.4 ms.

As the handling of digital audio signals in practice differs from that of analogue signals, you should observe the following suggestions in order to ensure dependable operations:

- The maximum cable length between two devices is 150 m.
- Use shielded 'Twisted Pair' cables with an impedance of 110 • (80 - 150 • are tolerable). They are available at specialty stores and are called 'AES/EBU Cables'.
- Do not mix any cables with different impedance within one transmission line.
- Do not use any 'classical' XLR audio cables!
- The cable may not be bent too much or pulled over sharp edges. Please observe the permissible minimal bending radius which is provided by your cable's manufacturer.
- Ensure the soundness of the connectors.
- If the AES/EBU signal is to be distributed over several lines, then a special line splitter is necessary.

If no special 110 • AES/EBU cable is available, then data cables for lighting technology (DMX data cable with an impedance of 120 •) can be used.

14.2 Transmissions over long Distances

If transmission distances exceeding 150 m need to be covered, it is necessary to use a repeater.

The interface AES / EBU is the European Broadcasting Union's implementation of the Standards AES3 defined by the Audio-Engineering Society.

Further information is available at these organisations:

www.aes.org und www.ebu.ch

15. Wiring

Make sure that all units are switched off and all controls are turned down before connecting your system.

- Only use high-quality speaker cables, (i.e. from KLING & FREITAG).
- Adapters for connections between the Speakon connecting panel of the CD 44 and EP-5 / XLR-connectors, as well as for special uses must be professionally constructed.
- For analogue connections from the mixing console to the power amplifier inputs, please use shielded microphone cable with two conductors. For digital signal transmission you will need shielded twisted pair cables.
- Please pay attention to the respective pin diagrams in this manual!
- Avoid ground loops.
- Make sure that the +/- polarity of the speakers at the amplifier is correct. When simultaneously using power amplifiers from different manufacturers, be sure to use the correct specific pin configuration. It may be necessary to modify the pin configuration on the power amplifiers or on the connectors leading to them.
- Ensure that the connected speaker channels are working in phase (phase checker). A phase error can also be recognized when the connected channels are used simultaneously. During simultaneous use the bass frequencies become notably quieter or the mid-frequencies such as voices cannot be located.
- The cables should have a sufficient wire gauge. A minimum wire gauge can be easily calculated with the following formula:

$$\mathrm{WireGauge}_{\min}[\mathrm{mm}^2] = \frac{\mathrm{RequiredCableLength}[\mathrm{m}]}{2 \times \mathrm{Impedance}_{LS}[\Omega]}$$

- Please make sure that the total impedance of the loudspeakers is not lower than the minimal load impedance indicated on the power amplifier.

$$\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots = \frac{1}{R_{\mathrm{total}}}$$

16. Operating the Controller

- Make sure to observe the installation instructions and safety notes shown in the loudspeaker manuals and in the user's manual for loudspeakers and assembly equipment.
- Switch off all equipment and turn down all level controls on the mixing console and the power amplifiers.
- Wire the speaker systems according to the instructions in this manual.
- Now switch on the mixing console first, followed by the CD 44 Controller and, at last, the power amplifiers. Always use the before mentioned switching order. Otherwise switching noises may damage the system.
- If there is interference, turn off all appliances in the reverse order and check all cable connections.
- Successively turn up the individual power amplifier channels and send a signal with low volume to the system. Check to see if the desired signals are applied to the intended speakers and make sure there is no interference. Make sure everything works properly, i.e. if the signals come from the correct speaker paths (high signals from the tweeters, bass signals from the bass speaker). The SIGNAL-LEDs of the CD 44 Controller light up if there is an output signal greater than -45 dB. Your system is ready for use.
- Turning down the input level controls may not always prevent distortions in the input section of the power amplifier, especially if this section has a relatively low headroom. A clipping signal may not be displayed by the clipping indicator then! To prevent signal interruptions caused by protection circuits or damages to the speakers, turn the level controls of the power amplifier to the maximum position, if possible. Only turn up the signal level at the mixing console or on the controller far enough so that the power amplifiers are not overloaded; or reduce the limiter threshold at the controller (**Out1** through **Out4** → LimReduction).
- When turning off the system, turn down the input controls for the power amplifiers first, then switch off the power amplifiers and all other appliances.

Important

17. Technical Specifications CD 44

Eingangssignalverarbeitung		
	Eingangsdelay	Delay bis zu 200 ms bei 100 µs Auflösung
	Filter	Grafischer 31-Band EQ
		4 einstellbare Filter (Bell, LShelv, HShelv, HighP, LowP, AP)
	Verstärkung	Digitale Verstärkungseinstellung +20 dB bis -96 dB
Ausgangssignalverarbeitung		
	Ausgangsdelay	Insgesamt 40 ms (2 x 20 ms) bei 10 µs Auflösung
	Filter	12 Filter in den lautsprecherspezifischen K&F LS-Blöcken
	Limiter	RMS- und Peak-Limiter in den lautsprecherspezifischen K&F LS-Blöcken
	Verstärkung	Digitale Verstärkungseinstellung +20 dB bis -96 dB
Sense-Eingänge		
	Maximaler Eingangspegel	150 Vrms
	Verstärkungserkennung	20 dB bis 45 dB
Analog-zu-Digital-Eingänge		
	Eingangsimpedanz	10 kΩ symmetrisch, 10 kΩ unsymmetrisch, elektronisch symmetriert
	Nominaler Eingangspegel	+6 dBu
	Maximaler Eingangspegel	+18 dBu
	Frequenzbereich	+0/-0,2 dB, 2 Hz bis 20 kHz
	Klirrfaktor (THD + Noise)	0,0006 % (-105 dB) typisch bei 1 kHz/-1 dBfs
	Dynamikumfang	118 dB typisch, A-bewertet
	CMRR	65 dB, 20 Hz bis 20 kHz,
		75 dB typisch bei 1 kHz, 70 dB typisch bei 20 kHz
AES / EBU-Eingänge		
	Unterstützte Auflösung	Bis zu 24 bit
	Unterstützte Abtastraten	44,1 - 192 kHz, internes Dejittering durch Sample Rate Converter
Digital-zu-Analog-Ausgänge		
	Ausgangsimpedanz	<40 Ω, elektronisch symmetriert
	Nominaler Ausgangspegel	+6 dBu
	Maximaler Ausgangspegel	+18 dBu
	Frequenzbereich	+0/-0,2 dB, 2 Hz to 20 kHz
	Klirrfaktor (THD + Noise)	0,0006 % (-105 dB) typisch bei 1 kHz/-1 dBfs
	Dynamikumfang	119 dB typisch, 20 Hz to 20 kHz, A-bewertet bei +18 dBu
Analog-In zu Analog-Out		
	Frequenzbereich	20 Hz bis 20 kHz, ±0,1 dB
	Dynamikumfang	115 dB typisch, 20 Hz bis 20 kHz, unbewertet
	Klirrfaktor (THD + Noise)	0,0007 % (-103 dB) typisch bei 1 kHz / +17 dBu (alle Gains auf Null)
		0,001 % (-100 dB) typisch bei 1 kHz / +6 dBu (alle Gains auf Null)
	Auflösung Wandler	24 Bit
	Interne Abtastrate	96 kHz
	Interner Datenpfad	28 Bit Integer, Rechengenauigkeit: 76 bit
	Latenzzeit	0,5 ms (analog zu analog)
Fernsteuerung		
		RJ45 EtherCon™-Buchse für 10/100Base-TX
		Ethernet (IP)-Verbindung
Stromversorgung		
	AC	100 - 240 V~ / 50 - 60 Hz
	I nom.	150 - 100 mA
Abmessungen und Gewicht		
	Abmessungen (B x H x T*)	1 HE Rackmontage: 483 x 44 x 192 mm
		*Einbautiefe mit Netzkabel 260 mm
	Gewicht	1,8 kg